TIMEHRI

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The Royal Agricultural & Commercial Society

OF

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Edited by . . . . E. F. IM THURN, M.A.

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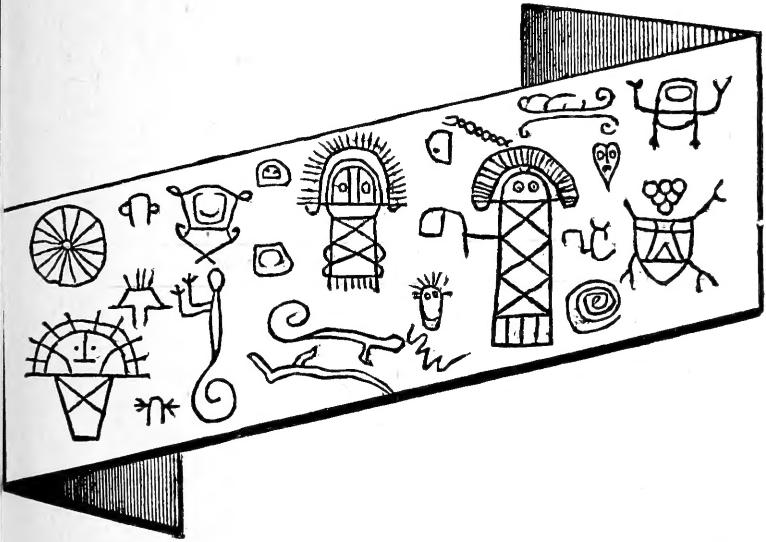

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Contents of Volume 3.

INDEX

TO VOLUME 3

OF

TIMEHRI.

A.

B.

C.

C.—*Continued.*

D.

E.

E.—*Continued.*

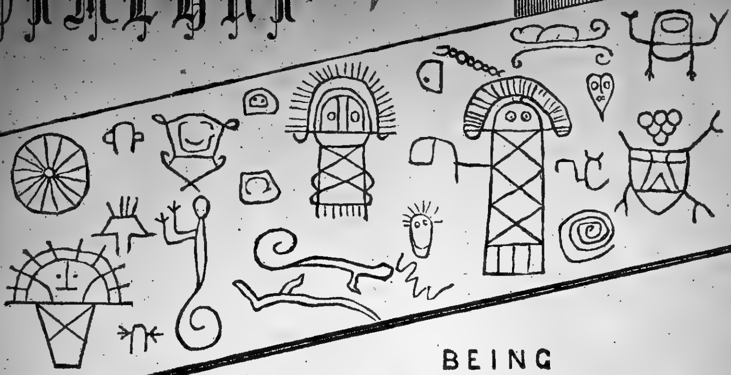
F.—*(Continued.)*

F.—*Continued.*

F.—*Continued.*

TIMEHRI:

from the Editor



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CONTENTS.

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Hunting Notes of a Bushman.

By Michael McTurk.

VISITORS to the colony, after being inland, often remark on the apparent scarcity of game and the absence of all animal-life in the forest. This impression is natural for many reasons, the two chief of which are that these visitors neither go to the right places nor at the proper times to find anything. Few countries are so covered with forest as is British Guiana; and, whereas in other countries the game has only comparatively small patches of cover in which to hide, here the whole country affords one large cover, extending without break for over a hundred miles, as far as the open savannahs and mountains of the interior. To find game, either bird or beast, the sportsman must be in the forest as soon as there is light enough by which to see; and he must know not only the trees on the fruit of which the birds or beasts he seeks feed, but also where these trees are to be found. In some localities there are no fruit-bearing trees of the right kinds; and in such places game of all kinds is very scarce. Another drawback to the European sportsman is his dress; his coat,

catching or rubbing against every bush he passes, and the heavy boots and leggings which, fearful of snakes, he often wears, prevent him from moving with the degree of freedom and quiet absolutely necessary to command success.

From these disadvantages the Indians are free. They are generally credited with being good huntsmen and good shots. As marksmen they are, with very few exceptions, very indifferent and would never think of firing at a moving animal or flying bird; but they are as a rule good huntsmen. They are thoroughly acquainted with the habits of the game and where this is likely to be found; and, owing to their freedom from clothing, they are able to move in the forest without noise and in perfect freedom. The slightest touch of a twig on the naked body is immediately felt, and either the branch is carefully moved aside or the hunter moves away from it; in either case no noise is made. Approaching in this manner, the hunter seldom fires until he is within a few feet of the game; and to miss is then almost an impossibility. Moreover the colour of an Indian's skin seems to assimilate with his surroundings in the forest, so that, except when he moves, it is wonderfully difficult to detect him, even at a comparatively short distance.

In some localities there is plenty of game, both bird and beast, as, for instance, up the Essequibo, above the falls, especially just below the mouth of the Potaro River. On the Caboori Creek on the Mazerooni, and, still higher up, on the Araparoo, a branch of the Cako, game of all kind is plentiful—muscovy ducks, powis, and, as the sides of the creek,

trodden as a cattle-pen, show, maipuri *(Tapir americanus)* and other animals. About a week's journey up the Cuyooni game, especially bush-hog and fish, is plentiful. There is abundance of game also on the Corentyn, above Orealla—good quail-shooting is to be had on the open savannah at Orealla itself—and on all the rivers running through the open savannahs; the caboora-flies* are, however, a dreadful nuisance on the open lands and make a stay there anything but pleasant.

From about half-past eight in the morning and throughout the heat of the day, the birds all cease feeding, to roost in the thickest trees and darkest parts of the forest, and they are then very difficult to find. This is true of the animals also, for these feed chiefly on fruit fallen from the trees. During the day, the bush-hogs dig shallow holes and lie in them; and other animals lie under the branches of fallen trees. About five o'clock in the afternoon all begin to feed again.

As regards weapons; with a good No. 10 choke-bore, with No. 6 shot in the right barrel and 4½ drams powder, and 1¼ oz. No. AA shot in the left barrel, the sportsman is prepared for all the game he may meet in British Guiana.

There are two kinds of wild hog, the kairoonie *(Dicotyles labiatus)* and the abouyah *(D. torquatus)* The former are the larger, and are frequently found in large droves of fifty or more, making so much noise that they are heard a long way off, the larger ones grunting and champing their teeth, the young ones squealing. When not frequently hunted, it is easy to approach

* These annoying little flies *(Simulium* sp.*)* are, however, confined on the open lands to the immediate neighbourhood of water.—ED.

these, with ordinary care, to within 20 yards, from which distance they can be killed with a charge of BB shot, lodged either on the side of the head or behind the shoulder. For food, the half grown sows are the best. There is generally a puma *(Felis concolor)* following the drove, killing and eating the stragglers from time to time as he wants food. Should this puma allow the hogs to surround him, or should he pursue some hog into the midst of the drove, he would be torn to pieces immediately. When hunted with dogs, the kairoonie does not run far, but, getting his hind quarters against a stump or under the branches of a fallen tree, he faces the dog until the huntsman comes up and shoots. The large tusks and formidable appearance of the kairoonie when at bay, together with the advantage of position, prevent the dog from seizing it without the almost certainty of being killed.

The abouyah is smaller than the kairoonie, and it is seldom that more than eight or ten are found together. They are more difficult to approach. When hunted by dogs they run into holes under the roots of trees or into a fallen and hollow log; sometimes four or five will run into one such log. The huntsman has then to block the ends of the log, being careful while so doing not to be bitten by the abouyah from inside; after all exits have been carefully and firmly stopped, a hole is cut in the side or top of the log, through which the abouyah may be either stabbed or shot. The Accawoi Indians make necklaces of the tusks of both abouyah and karoonie.*

* *All* the various Carib tribes make these necklaces, for a further account of which see "Among the Indians of Guiana," London 1883, p. 307.—ED.

Acoories (*Dasyprocta aguti*) are plentiful all over the colony.* There are said to be two varieties of acoorie, of which one is black and is nocturnal in its habits; but the existence of this black variety wants confirmation. The black kind has often been described to me; and on one occasion I myself hunted something that looked like a black acoorie, but as I did not succeed in killing it, and indeed only saw it for a moment as it rushed by into a hole, I cannot say I have ever seen one. The easiest way to kill acoories is to make a platform of sticks, about eight or nine feet from the ground, and from this to shoot the acoorie when it comes to feed, either between 6 and 8 o'clock in the morning, or between 4 and 5 in the afternoon. Almost any dog will chase an acoorie, but few have wit and perseverance enough to capture it. Acoories are very tricky and will resort to many manœuvres to throw the dog of the track; sometimes one will run into one end of a fallen log, stop, carefully leave traces of its presence, and then run out at the other end, so that the dog, coming up, is arrested by the strong scent and stops to bite the log in which it thinks the acoorie still is. Dogs that know this trick try both ends of the log before stopping. If there is a shallow creek, the acoorie will jump into the water and run along through this as far as possible; or, if the creek be deep, the acoorie will repeatedly swim across it from side to side; in either case the object of the manœuvre is to throw the dog off the scent. In any case, an acoorie

* It is perhaps worth noticing that the smaller, allied species of the adoorie (*D. acuchy*) is apparently not present in Guiana north of the Essequibo.—ED.

never runs straight, and it generally comes back to the place from which it was first started by the dog. When running, it will stop and listen, and if it finds that the dog is not coming in its direction, will stand and let the dog go by. If the dog is used to this kind of game and keeps on the track, the acoorie will eventually run into a fallen hollow log, from which it must be cut out with an axe. Sometimes though rarely, the acoorie takes to the water, when, as it cannot dive like the labba, it is easily caught and killed.

Three kinds of deer are known to the writer; the waiking (*Cervus savannarum*), the beyou (*C. rufus*) and the wirribisceri (*C. humilis*). The waiking is the largest, and frequents the savannahs and open lands of the interior; the buck has horns similar to, but smaller than, those of the red deer. It is difficult to hunt these deer with dogs, as the latter rarely have sufficient endurance to run the game down, and there are seldom rivers of sufficient size, in the immediate neighbourhood these deer frequent, into which they can be driven by the dogs and so caught while swimming. They are generally shot by creeping up to them through high grass or from the clumps of trees standing on savannahs. The skins of this kind of deer are sometimes used by Indians on the savannahs as screens for their doors or windows.

The beyou and the wirribisceri are both forest deer, and are plentiful all over the country. Sometimes, though, very rarely, they are caught in the bush by dogs. As a rule, they are killed, after having been driven into the river by dogs, by certain of the hunters waiting for the purpose in a canoe. Of the two

huntsmen, the one who goes with the dogs carries with him a cutlass and a horn, with which latter, according to a concerted code, he can signal to the one left watching in the canoe as to the direction in which the deer is running—thus, several blasts at short intervals may mean that the deer is going up the river, a long followed by a short blast that it is running down stream, and continuous blowing that the deer has turned and is making for the water. When first found by the dogs the deer almost invariably runs inland; but, on finding itself persistently pursued, turns and takes to the water. Should the hunters watching in the canoe make any noise or in any other way attract the attention of the deer before it is in the water, it will make for the land, and in nine times out of ten will escape. But if, in perfect stillness, these watchers keep close into the side of the river, and, when the deer takes to the water, they allow it to swim well out, and if they then get between it and the shore, they may then, and only then, attempt to catch or kill it. Under no circumstances must the deer be shot with a gun while swimming in deep water; for, if so shot, it would instantly sink, not to rise again, except in rare instancs, before the lapse of four or five hours, and never to rise again in rivers frequented by perai.*

Another way of killing beyou and wirribisceri is by watching for them at night in the cultivated clearings, to which they come to feed on the young cassava leaves. For this purpose, the huntsman makes a platform of sticks, about 15 or 20 feet from the

* On this subject, of the rise to the surface of animals shot whilst in the water, see note in Timehri, Vol. 2, p. 110. The perai is of course that voracious fish *Serrasalmo nigra*—ED.

ground and, if the path of the deer allows it, at the edge of the clearing, where it is less likely to attract attention. The platform is made by driving three or four poles into the ground, lashing short cross pieces from pole to pole, and then laying smaller pieces of wood side by side from cross-piece to cross-piece, the whole being firmly tied together with bush-rope. A roof of palm leaves is sometimes put over the whole, to protect the huntsman from rain. Then, by patiently watching on this platform a shot at the deer may be had. BB or No. 1 shot is best for the purpose; the ear and behind the shoulder are the best places at which to aim.

The savannah deer and the beyou are both red in colour; the wirribisceri is mouse coloured and very much smaller than either of the others. It is about the size of a chamois. The buck has small straight horns about four or five inches long. The venison is whiter and not so dry as that of our other deer. It is a rare thing to get a fat deer; out of many killed by the writer only two were fat, these being, apparently, barren does. The sex of a deer can generally be told by its track; the hoofs of the buck are as a rule round, with the toes even, while the doe has a long foot with frequently one toe overlapping. Deer are rarely shot while hunting without dogs in the forest; they are very shy, but will sometimes, when well concealed, allow a person almost to walk upon them. Deserted Indian fields, called mainaps, and in the high forest under the leafy branches of fallen trees are the best places to look for deer.

There are two kinds of maipoori or tapir, distinguished by the size and a mark on the ears. The largest maipoori

has a body as large as a donkey, but its legs are shorter, and it is of a dark brown, almost black, colour all over. The other kind is slightly smaller and of a lighter colour, and has white tips to its ears. Maipooris are nocturnal in their habits, and are never found far from water. They feed on different wild fruits, particularly on the seeds of the æta palm (*Mauritia flexuosa*) and also on the leaves of several small trees ; to get the latter the maipoori seizes the tree in its mouth, and bending it sideways, breaks it down sufficiently to get at the leaves. Indians when going through the forest often break small trees in a similar way to mark their trail, and an inexperienced person would see little difference in the breakings, and might lose himself, mistaking the track along which a maipoori had been feeding for a "cortahie" (the name of an Indian track made by breaking the small trees as described). Maipoories like a dry place to sleep during the day and are particularly fond of a "moorie" for that purpose. Moorie is the Indian name for the low shrub that grows on barren white sand, and gives its name to the places on which it grows. A moorie* is always high and dry, and the bushes growing on it make it difficult to detect the maipoori. In dry weather the fallen leaves must especially be carefully avoided, as they make a crackling sound when trod on that are sure to attract attention. The maipoori always turns before it lies down and faces the direction from which it came. Its eyesight is not particularly acute, but its ears and nose are ever ready for the slightest noise and taint in the air. The cry of the maipoori is a sharp shrill whistle

* For a further account of moories see *Timehri*, Vol I. p. 291.—ED.

repeated at short intervals; when lying down in the day time if a hawk should scream near by, they will in a half dreamy sort of way emit a single note, which is a great help to the huntsman if he is within hearing. The Indians always put three bullets in the gun when hunting maipoori, and often on that account lose the animal, the powder not being enough to give the bullets sufficient force to penetrate to a vital part.

Maipoories are hunted with dogs, and are generally killed in the water; but if the dog is well trained and will bite the maipoori (which it can easily overtake) instead of chasing it, the latter will at once sit on its haunches to fight the dog; this gives the huntsman an opportunity to come up and kill it. The maipoori generally sits with his back to a tree or near dense bush in such a position that the dog can only attack it in front. Another way to kill them is to watch for them at night when they come to feed, or at the pits formed in swamps in dry weather, where they go to excrete. In these instances a platform is made, large enough for two persons and about fourteen feet high, and on this the hunters remain quietly until they hear the maipoori eating or splashing in the water. One person then carefully lights a candle and endeavours as he best can to throw the light on the animal, while the other shoots; if care is taken to make no noise, the maipoori will give the shooter ample time to take aim and fire. Maipoories never excrete on dry land if avoidable, and will travel long distances in dry weather to the pools they frequent for this purpose.

Labba (*Coelogenys paca*) are nocturnal in their habits, and during the day lie in holes in the ground, generally in those made by the armadillo, or in a hollow

log. A labba never voluntarily goes into a hole, either in the ground or in a log, that has not got a "back door" to it, that is, another hole through which it can escape. These back doors are carefully concealed, often being under a root, and in all cases are stopped with dried leaves, to resemble the other dried foliage on the ground. In dry weather labba are never far from the banks of a river or creek, but in the rainy season they go further inland. They are hunted with dogs and killed in the water, or from a platform at night, like the maipoori. The labba has powerful jaws and often bites the dogs severely. The labba will dive and remain under water a considerable time, and when it comes up only puts its head above the surface against the bank or under a log or among fallen branches. Where there are long hollows with holes under the bank of the river or creek it is a waste of time to hunt them, as they cannot be got at in such places. At the heads of creeks where mora-roots overhang the water they escape in a similar manner.

If the labba when far from water is closely followed by the dog it sometimes rushes into a hollow log or into a hole in the ground. In the first case, after making sure that the labba is really in the log and has not merely passed through, all holes in the log must be carefully and securely stopped with pieces of wood, one only, whichever may be most convenient, being left partially open so that a rod or a piece of bush rope may be passed in, to feel for the animal. The twigs on the end of the rod should be bent back and splintered, or the end of the bush-rope should be knotted and pounded; this is in order that the end so prepared, touching

the animal, may bring away some of its hairs. The rope or rod as soon as it apparently touches the animal is withdrawn and, if hair on it indicates that it has really reached the game, is laid along the log from the hole, so as to measure the distance at which to chop an opening with an axe. Sometimes it will be found that the animal has moved further on or has gone back toward the hole by which it entered. The first cut must then be stopped, measurements must be again taken, and a new cut made far enough to leave the animal between the two cuts. The opening may either be made behind the animal, which may then be taken out alive, or it may be made, of small size, near its head, so that it may be stabbed by a knife thrust through the hole. If the holes are far apart and the animal moves about, a small hole must be cut about half the length of the animal from the first hole, which latter must be covered with a moocroo leaf, or any other broad leaf, held tightly down with the hand, so as to exclude all light. Then, by poking the animal with a rod passed through the uncovered hole, it may be driven up to the covered hole where it will be felt at the leaf. It may then easily be killed with a knife.

It is much more difficult to get a labba from out of a hole in the ground. If there is a 'back-door' the labba may be made to rush out through this by introducing a long rod through the passage by which it entered. The twigs and leaves on this rod should be bent back so that when the implement is pushed into the hole and pulled backward and forward it makes a noise, which scares the labba and causes it to rush from the other outlet. Young leaves of the kokerite palm *(Maximiliana regia)* make the best rods for this purpose. If the burrow

is short and has no other outlet the labba may be dug out; or it may be driven out by filling the hole with water, if there is any near. But if the hole is deep, the quarry must, if time allows, be burnt out. To do this the hole must be enlarged somewhat, so as to form a rough fire-place, in which a fire of dried wood and leaves must be made and kept up for twenty minutes or half an hour. When plenty of embers have collected, green wood must be put across the hole over the fire, and palm or other leaves over that; and then the whole must be covered with earth to keep the heat in. All this must be done as quietly as possible. The fire consumes the air in the hole; and the animal, being suffocated, will be found, when the hole is eventually opened, dead close to the fire. But if noise has been made in making the fire or if sticks have been poked into the hole, the animal will have retreated to the far end and possibly may never be got out.

Labba often come at night close to the Indian houses to gnaw bones, crab shells, or tortoise backs. They do not seem to fear the dogs much at night. The writer once shot a labba, which was in the habit of coming nightly to gnaw crab shells at a place where he was stopping, by putting a piece of white paper about four inches square on a stick low down on the opposite side of the crab shells to where he sat watching. When the labba was heard gnawing he kept his eye fixed on the paper and when it was obscured fired and killed the labba. Labba are often killed by gun-traps; but these are dangerous anywhere but in the most unfrequented paths, and to set them properly requires a great deal of care.

Essequibo, Berbice and Demerara under the Dutch.

PART III.

By the Editor.

C*APTURE by the English. (A.D. 1796-1803.)** Guiana as it was found by the English when they occupied it in 1796, has been well described by GEORGE PINCKARD, who, as deputy Inspector-General to His Majesty's forces, went to Barbados early in 1796 with the expedition against the Dutch under Sir RALPH ABERCROMBY. From Barbados he was sent in April with the detachment, under General WHYTE, despatched to occupy the colonies in Guiana; and there he was engaged for more than a year in organizing military hospitals to receive the terribly large, and ever increasing number of those of the troops on whom yellow fever, the once and, in a less degree, still terrible West Indian Yellow Jack, seized, the only enemy—and it was a very terrible one—with which the troops experienced any serious difficulty. The official duties of PINCKARD thus gave him most intimate relation to the commanders of the occupying force; and, at the same time, his own genial nature brought him into equally intimate social relation with the hospitable inhabitants of the occupied land. He probably saw more of Guiana than any other man of his

* The materials of this chapter are almost entirely derived from the second and third volumes of the 'Notes on the West Indies written during the Expedition under the late Sir RALPH ABERCROMBY,' by GEORGE PINCKARD, M.D., London, 1806.

time. Sometimes he was at one or other of the few centres of population, engaged in his harassing work, sometimes he was seeking very necessary relaxation in the houses of the planters or in travelling up the rivers; but wherever he was, he found himself a welcome guest and he kept his eyes wide open. His private letters to a friend in England, being afterward published, afford a picture as complete as need be of the Guiana of those days.

On the evening of the 20th April 1796 the English ships lay at anchor in the muddy water outside the mouth of the Demerara river. The scene which those on board saw before them was neither terrible nor inviting. Just in front, in the obtuse angle formed by the left bank of the river with the sea coast, lay the town of Stabroek, defended only by a miserable little fort occupying the most seaward point. Right and left from the mouth of the river stretched the low, flat, muddy coastland, varied here and there by bands of shore-growing bushes behind which were seen the tops of a few palm trees. That evening was spent, so certain did it seem that no resistance would be offered, in preparation for landing on the morrow, and especially in impressing on the soldiers the necessity of abstaining from plunder and from all disturbance of the peaceful ways of the inhabitants. The next day an attempt was made to send the troops on shore in small vessels, some of which had been brought for the purpose from Barbados, others had been captured off the coast, which were supposed to be sufficiently light to pass over the mud-bar and shallows which formed a natural protection to the harbour. But even these boats grounded on the flats and lay helpless and exposed to attack until the tide

at night released them. But all this time the inhabitants of the land remained passive. Early the next morning, the 23rd, the English commander, encouraged by the absence of all resistance, sent a boat to the shore, carrying a flag of truce, to demand capitulation. In a few hours the negociations were completed and it was announced that at four o'clock that same afternoon the Dutch troops would march out of the fort, to allow its occupation by the English. The latter at once began to land.

PINCKARD in his account of his personal experience during this peaceful landing gives a very good picture of Stabroek and its surroundings :—

> From the landing place we had nearly a mile to walk to the town; and such a walk, perhaps, could not have been found in any other country, Holland excepted. From the nature of the road it was impossible to maintain ourselves upon our feet for a single step . . . . We had to drag along in the rain, either ankle deep in mud, or slipping and sliding about upon the wet surface of the clay . . . . At the town we found our feet relieved by stepping on a narrow causeway, paved with small bricks put edge-wise into the ground. The land appeared as one wide flat, intersected with dykes and canals; the roads were mere banks of mud and clay thrown from the ditches at their sides; and the houses bedaubed with tawdry colours . . . . The town is simply two long rows of houses, built very distant from each other, with a wide green in the middle by way of street. It is more than a mile in length, running from the river back to the forest . . . . Canals and ditches have been dug at the backs of the houses . . . . being receptacles for mud and all the filthy drainings of the town. The causeway of bricks is carried throughout the whole length of the street, but the carriage road is of mere mud and clay.

Terms of mutual accommodation were soon arranged between the conquerors and the conquered. The colony was to remain in the hands, and under the protection of, the English, and its trade was to be directed toward

England. The military arrangements were to be made by the conquerors; but all civil matters were to proceed as before and according to their established forms. Such of the Dutch troops as chose were to enlist under the new rulers, a privilege of which many seem to have availed themselves. The Dutch governor and officials were not to be removed from their posts. All private property was to remain with its previous owners; but public property was confiscated to the use of the conquerors.

The terms were so easy, and even so pleasant, to the settlers in the colony of Demerara, that within a fortnight the neighbouring colony of Berbice, being offered similar terms, accepted these without hesitation.

Almost the only recorded instance of even individual resistance to the surrender was, not by a Dutchman, but by a French captain of a privateer, which happened to be lying in the harbour. This captain, a most furious republican of the Great Republic, was so resolved not to strike his flag to the "tyrant-English" that, unable to make his escape by any other means, he ran his ship some distance up the river and there scuttled her, and, having fastened a bottle containing a scurrilous and abusive letter to the mast head, which remained above water, fled into the forest where, as was natural, he perished.

The whole of that which is now British Guiana was in the hands of the English. Its boundaries, though, as was natural under the circumstances, no special attention was given to these details, were of course the same as had been those of the Dutch colonies of Demerara, including Essequibo on the west and of Berbice on the east.

Within this land there were only two towns, Stabroek and New Amsterdam; but there were also one or two military posts, of which the most important were that on the river Morooca and that on the Mahaica, a river about twenty miles east of the Demerara. Along the coast were scattered various plantations, though none of these had been very long established; and up some of the rivers, especially on the Berbice for nearly fifty miles of its course, there were plantations, also scattered, but of much older date. Between these centres of population, towns, military posts, and plantations alike, the only communication was by water.

The most striking feature in the account given by PINCKARD is the joy, in their own capture by an enemy, which was evidently felt, and almost universally expressed in hospitality, by the settlers. Yet there was still a very large Dutch element in the population. Many, probably most, of the merchants and their dependents in the town of Stabroek were English; but everywhere else planters and towns people alike were chiefly Dutch. In his journeys up the rivers, PINCKARD found that the residents were more often than not unable to speak any language but Dutch, with perhaps a little French; in short there is hardly a page in the letters of that writer which does not very plainly show that by descent, as well as in language and habits the people of Guiana were in his day still for the most part Dutch. Yet these people welcomed their new rulers with a hospitality probably unparallelled on any other occasion, as coming from a just conquered people. They received the new comers into

1 PINCKARD.—Vol. iii., p. 250.

their houses. This was PINCKARD'S personal experience of his treatment on the first day by the enemy:—

Among the happy events of the day, fortune threw me in the path of another gentleman residing in the town, who, upon observing me scrambling through the mud and clay, insisted upon my taking his boat and slaves to convey me to the fort by way of the river, assuring me that to walk it might be a dangerous excess of fatigue; and further, directing his negroes to wait and bring me back to his house to dinner. Perhaps I was a little induced to refuse, but it had been difficult to resist the pressing civility with which the accommodation was offered; accordingly I accepted the boat, and, afterwards, returned and eat of broiled fowl and a roasted kid. During dinner the friendly invitation was extended to a request, almost amounting to a demand, that I would make that house my home so long as the service should require my continuance at Stabroek. Thus has fortune at once established me in good quarters in the enemy's country, without a billet, and even without the trouble of seeking one.

Nor were the country people behind hand in their hospitality; almost every planter cordially invited the strangers to his estate and, when he had secured the attendance of the latter, treated them with lavish kindness. In fact, throughout the colony the English occupation was the signal for a universal jubilee.

Perhaps the most curious feature in this business is the way in which the two nations, though at war in the outside world, yet in Guiana, if I may be allowed to use a chemical simile, mixed but did not amalgamate. Two systems existed side by side in the land, closely mingled, yet without exercising either mutual attraction or repulsion. For example, when the Stadtholder's birthday came round, the Dutch observed it with festivities in which the English, being cordially invited, shared; and when the birthday of His Majesty of England occurred, there were again joyous festivities, but with the parts of hosts and guests interchanged.

Many of the Dutch soldiers had, as has been told, entered the English service; but those who had not done this remained in the colony, living and drilling within sight of the English military posts. For example, one day at New Amsterdam, PINCKARD saw a curious scene of military life in which the actors were partly Dutch partly English. The object was the punishment of a soldier in the Dutch service, for drunkenness. Two ranks, of about twenty men of his fellow soldiers, each armed with a green newly gathered switch, were drawn up face to face, with just sufficient distance between to allow a clear pathway for a man to walk. At one end of this pathway stood the drum-major, provided with a huge staff; and behind him was the culprit, stripped to the waist and with his arms bound behind him. Behind the two ranks were ranged the non-commissioned officers, each cane in hand. Near by stood the drummers ready to beat a loud and slow march. Round this central group arranged in military order, had gathered a group of spectators, among whom were various officers and men belonging to the English troops looking curiously at Dutch military pomp. When the drums were struck, the major, followed by the culprit, marched slowly to their sound backward and forward between the ranks; and as they passed, each man in the ranks used his switch on the prisoner's back, or, if in pity he abstained, received an equivalent cut on his own back from the cane of the non-commissioned officer behind him. Even during the proceedings an English soldier staggered forward, himself drunk, from among the spectators, and lurched against the central group of Dutchmen, uttering such ejaculations as "That's right, comrades; give it

him; lay it on, boys; make him smart for it; make him remember it, a drunken Dutch dog." Then, writes PINCKARD, 'the Captain of his own company, who happened to be present, immediately ordered him into confinement in the guard house, preparatory to being led forth, at a more sober moment, to probably a severer punishment.'

Primitive as Stabroek was, it was yet far more fully developed than was New Amsterdam. The latter was, indeed, at the moment hardly in existence; for the old town of that name, which had been some forty miles up the river, had recently been abandoned, owing to the growing tendency to cultivate the coast-lands in preference to those up the river, and the colonists were at the time building the new town, on its present site, close to the mouth of the river.

"The town," wrote PINCKARD, "is yet in embryo. According to a plan formed for its construction it is to be built upon the angle, or peninsula, between the rivers Berbiche and Kannye, extending along the bank of the Kannye. The land on which it is to be erected is in part cleared of its wood and divided into lots ready for building; but, at present, only here and there a scattered home is to be seen. Beyond the prepared land, and not half a mile from the Government house, the wild forest still overhangs the river Kannye; but those powerful engines the destructive axe and all-subduing fire, are now directed against it, and consequently it cannot long remain a forest. The whole scenery at New Amsterdam betrays the infant state of the colony. The dreariness of the land, just robbed of its thick woods—the nakedness that prevails around the Government house—the want of roads and paths—the wild savanna—the heavy forests, in short all that meets the eye, conveys the idea of a country just emerging from its original wildness into cultivation."

In both towns the markets were overstocked with vegetable provisions, but were very badly, or indeed hardly at all, supplied with animal food. For vegetables the chief market was held on Sunday and was supplied

by what the negroes either grew or stole. But meat was so unattainable in the colony that plans were devised for procuring a supply from the Spaniards of the Orinoco and Trinidad. There were very few retail traders; for the labouring classes were chiefly slaves, and the supplies for these were bought in large quantities by their owners. Such professional men as there were seem to have been of low social standing; for example, the surgeon was still also a barber, and, at least in one instance, was able to entertain the men of the English medical staff, while he lathered and scraped their chins, with a long discourse in Latin on medical subjects. One wonders as to the feelings of the patient, if he happened to be irritable by false quantities and dog-latin, toward the operator who held his nose between his fingers and held a razor to his throat. Newspapers did not exist. There was no church, nor was a public religious service anywhere held. The only importance of the towns, in short, arose from the fact that they were the centres of administration; for in them lived the Governor, round whom, when there was need of legislation, gathered the members of the Council and of the Court of Policy. In the towns, too, the civil and criminal courts were held.

The whole reason for the existence of the colonies lay in the plantations. Some idea of the number and situation of these places may be formed from the following facts. On the sea-coast between the Demerara river and the boundary of the colony of Berbice, (the Abary river) there were 116 estates. These were rectangular in form, extending side by side along the coast, the sea forming their frontage. Arrangements had been made for a second line of plantations, technically called 'second

depths,' behind, and parallel to those on the coast, which were technically called 'first depths.' In laying out the 'first depths' care had been taken by the Government to reserve a narrow strip of land, called the colony path, between each, in order to give access to the sea to those who might occupy the 'second depths.' Moreover, between the 'first depths' and the 'second depths' a canal had been planned, similar in purpose to those which in a former chapter, I described as having been actually made from the other side of the Demerara to the Essequibo; but this plan for a canal on the the east bank of the Demerara was only very partially effected. Very few 'second depths' were ever occupied. Up the Demerara there were but few plantations; for this river had been colonized after the tendency to settle on the coast rather than along the river banks had arisen. In Berbice the case was somewhat different. There the plantations were scattered far up the river and there were as yet comparatively few, though they were fast increasing in number, on the coast.

The chief object of cultivation was cotton. Of the 116 plantations between the Demerara and the Abary, all but one were planted with cottton. The single exception, that of Plantation Kitty, close to Stabroek, had recently been planted with sugar. This exceptional case is noteworthy, because within ten years of the time at which PINCKARD wrote, not only had cotton been rejected for sugar on many other of the old plantations, but very many new plantations were made and planted with sugar; thus began the movement which has since caused sugar to be practically the only article produced by Guiana. But in the time of PINCKARD,

though cotton was the chief, it was not the only object of cultivation. Coffee was still largely grown, especially in Berbice, which produced berries of exceptional and famous merit. Another feature deserving of notice in the agriculture of these days is that very much more attention than has since been the case was given to the cultivation of miscellaneous produce, such as the infinite variety of tropical fruits and vegetables, for the use and enjoyment of the planters; in this, as in so many other ways, the colonists of those days acted in accordance with their intention to make homes for themselves in Guiana.

Once more I shall make use of PINCKARD, as an eye-witness of the state of the plantations in those days. Of the coast-land, he writes, 'the whole of the land is one wide-extended plain, thickly covered with cotton-bushes, and everywhere intersected with ditches and canals like the low territory of Holland.' The following is a picture of a particular cotton estate then in process of formation just within the mouth of the Berbice river:—

> The house is a compact dwelling, neatly built of plain wood, offering in its exterior nothing to attract the stranger's eye, nor to bespeak the luxury within. It stands on the border of the sea, open to the wide ocean. Before it is an extensive and flat beach of firm sand, forming a pleasant ride or walk at the side of the water. The estate is quite in its infancy, being recently formed out of the rude forest, and indeed only now breaking into cultivation. In great part of it the young plants of cotton are just shooting from the soil between the remaining stumps of trees lately destroyed . . . . We had a pleasant ride about a mile and a half through fields of cotton and of plantains, the negroes running at the horses' sides, according to the custom of the country, as fast as we chose to ride.

Another extract, describing a different scene on one of these cotton estates, may be given:—

> In the evening we were conducted to the logie to see the slaves

engaged at their employment of spinning cotton. The building was very extensive, and we were led by way of a gloomy staircase to the upper story, where the blacks were all employed in one deep room, which ran through the whole length of the logie, and which, from the scene suddenly breaking upon us, created strong ideas of the regions of old Pluto. The stairs opened at one end of the long building, and the eye at once looked down an immeasurable depth of glimmering darkness, through which was obscurely seen a multitude of naked black beings, either at rest or skipping about from place to place, without our being able to distinguish what they were doing or how employed. As we approached nearer to them, we found them to be a gang of negroes, old and young, robust and feeble, male and female, all busily and variously occupied in preparing cotton, by the aid of one faint light suspended in the centre of what seemed interminable darkness. Some were squatting on the floor; some at the ginning wheels; some were crouched upon their haunches; others standing and moving about: each according to the varied employment of ginning, of beating and pulling, of fetching and carrying, or of packing cotton.

Of one of the coffee plantations, which were somewhat away from the coast, he writes :—

This estate differs from the wild fields upon the coast only in being a flat surface of coffee, instead of cotton; but it is rendered rich and inviting from being traversed with green walks, shaded with fine rows of trees, whose loaded branches bend under the various species of tropical fruits, serving at the same time to delight the eye, regale the olfactories, and refresh the palate. A pleasant path, more than a mile in length, and of sufficient width for carriages, leads down the middle of the estate, the sides being decorated with mangoes, oranges, avacata pears, and many other kinds of fruit. Crossing this walk, near the centre, is a thick grove of many hundreds of orange trees clad in all the variety of umbrageous foliage, fragrant blossoms, unripe green, and ripe golden fruit.

But the most picturesque and characteristic of these descriptions by PINCKARD is of the reception of himself and a party of other English officers on one of the most secluded estates in these colonies by its eccentric owner :—

"M. Bercheych is a remarkably fine old man. He is robust and square.

built, of hale countenance and sturdy form, very erect in his carriage, and preserving uncommon activity, together with great bodily strength, and vast energy of mind. From his figure and the formality of his address, he appears to be stern and unbending, but in reality he is affable, jocose, and communicative, and has nothing of the cold reserve of his country about him. He met us dressed in coat, waistcoat, and breeches of nankeen, all cut in the true antique; a very large and almost cardinal hat, of white beaver; shoes well squared at the extremities, and fastened with a pair of plain small buckles: a long staff in his hand, and his knuckles ornamented with deep ruffles. As he walked, his staff and right hand ruffle made an extensive sweep, describing a wide circle; his step was firm and decisive, the tail of his coat moved with an important swing from side to side, in unison with the majestic sway of his body—and his general air was commanding and dignified. On arriving at the house, he welcomed all the party individually, going through the ceremony of deliberately taking each by the hand, and bowing to him with the profoundest politeness and urbanity. We took our seats in a cool, romantic little cottage, which, in appearance and in the simplicity of its structure, might have vied with the dwelling of a hermit. Its walls were built of the caudices of the leaves of a fine species of palm called Eta, which in substance are lighter than cane. These were placed together perpendicularly, and resembled a number of well-arranged columns or small pillars, which were divided and supported at intervals by others of the bamboo, somewhat larger; nor were any of them concealed or defaced with paint, paper or stucco, but all were exposed in the naked simplicity of their original form. The partitions dividing the rooms were of similar structure; the floors were of brick; the windows, simple openings in the walls; and the furniture of plain wood, unadorned. In point of situation too, this native little cottage might have been a hermit's fit abode; for it is placed at the border of a wild savanna, overhung with heavy, impenetrable forests, and far removed from the busy tumult of the world."

"The estate is at the greatest depth from the sea, being the most distant that has yet been cultivated upon the Mahaica creek, consequently it is most in the forest, and nearest to the wild Indians. Deep and unexplored woods reach near to the door; before the windows grow cotton bushes and bananas; a small canal passes by the side of the cottage; and the only extensive view is over a wild savanna, carrying

the eye, even beyond its reach, in unbroken range between the savage forests."

The owner "sought employment in the cultivation of the rude spot which forms his present home, and which is now so improved as to yield a fertile produce in cotton. Until very recently he had tried at a different part of the estate, where he had built a house, and near to it planted a garden, which yielded a plentiful supply of choice fruits and vegetables; but from the plantation becoming extensive, he found it expedient to establish his residence at a more central part of it; he has therefore built this romantic little cottage to serve as a temporary house from whence he may conveniently superintend the erection of a more spacious abode, at a spot already marked out for that purpose."

"His garden and estate afford a very ample supply of plain and wholesome provisions. His flocks and herds are numerous, and his plantation exhibits a more abundant stock of cows, sheep, and poultry than is common at other estates."

"We were served only by females, of whom M. BERCHEYCH has the finest assemblage I have yet seen among the people of colour. We learned that it was one of the peculiarities of our host not to suffer a male to inhabit his house. His habits are social; but men are only admitted as visitors."

"The old gentleman is rigid and imperative towards his slaves, but his government is so tempered with kindness and humanity that he is obeyed more from esteem than from fear of compulsion. In the observances of politeness, Mynheer BERCHEYCH descends to the correctest minutiæ. From his appearance, his manners, address, and stately carriage, he might pass for an old English baron. The formal system of bowing he supports with the tenacity of a very Dutchman. Not a true-born son of all-bowing, hat-lifting LEYDEN itself could be more precisely polite. He even requires, and returns, a ceremonious salutation every time that he is met or passed by any of his slaves—not one of whom dares to go by him without being uncovered. A negro belonging to another planter attempted to pass him without offering the necessary salute, and he immediately gave him a stripe with his cane, observing that 'if he did not know good manners he must be taught; I would not suffer a negro to show more of politeness and good manners than myself; but if he attempts to pass me without proper observance, I always deem it right to instruct him that respect is due to the whites.'"

"Nothing could exceed the neatness of the arrangement which dis-

played itself about his little cottage home. Plainness and simplicity prevailed throughout, but a palace could not be cleaner, nor maintained in greater order. A small dairy, of exquisite contrivance, was most delicately fitted up, and appeared delightfully fresh and cool; a little poultry yard, enclosed with a fancy paling, was a perfect model of taste; and every thing around exhibited some mark of excellence, some testimony of having courted the ingenious hand of its industrious and eccentric owner."

"Around the cottage he has cut a deep wet fosse, which forms a protecting barrier, and prevents any person from approaching his residence but by way of a narrow plank, placed across the ditch directly in front of the dwelling; and so extremely rigid is he in the exclusion of male beings that not even a negro is allowed to cross this plank without first obtaining his express leave. In the plan of the new house which he intends to erect is an encircling ditch or moat of fourteen or sixteen feet wide, which he expects will prove a complete defence to his retired seraglio."

It is natural for the mind to turn from these plantation scenes to the consideration of the condition of the slaves; and of this matter PINCKARD, who must have surpassed most of the educated and non-colonial Englishmen of his time in pity for the hardships which were too frequently the lot of these slaves, gives an especially full and striking account.

Even at this time the number of slaves in Demerara and Essequibo alone was 55,000, and it was still being so rapidly increased that ten years later it had reached 80,000. The largest number, we are told, owned by any individual was nearly two thousand human bodies and souls belonging to a certain Mynheer BOODE, a planter on the western coast of the Demerara river, who, though then vastly rich, is said to have reached the colony originally as a drummer boy in the Dutch service.

Within the first few days after the surrender of Demerara to the English, a slave-ship arrived and landed its

cargo of several hundreds of human beings. As regards the horrors commonly supposed to have always prevailed on such slave ships, PINCKARD, who had not only paid considerable attention to this subject but had also, in his official capacity, been obliged to devise means for preserving the healthfulness of the troops on board the transport ships, was of opinion that the slaves during their transport from Africa to the West Indies were, at least normally, well treated. "I took occasion," he writes—

"to note in a former letter that the nakedness of the slaves was perhaps their greatest security against disease; but in addition to their being without clothes, they are compelled to remain constantly upon deck in the day-time and are encouraged to exercise and amusement; their sleeping places are completely washed out as soon as they quit them; and no species of baggage, nor clothing—not a bundle, nor any article of bedding, not even a single blanket, nor a sheet, nor any kind of thing that can create filth or collect impurities, is admitted. Ventilation and washing are strictly observed, and the slaves are encouraged or compelled to cleanliness of person; and together with these means, perhaps their simple diet of vegetables and water may greatly contribute, by diminishing the predisposition and lessening the susceptibility of disease."

The writer of these words seemed to wish that in many respects, allowing of course for the fact that Europeans, unlike Africans, are the better for clothes, the rules of life which prevailed on board slave-ships could have been maintained on board troop-ships.

The slave markets were conducted somewhat differently in Demerara and in Berbice. In the former place the slaves to be sold were divided into three lots according to their supposed value, and 'were exposed, naked, in a large empty building, like an open barn. Those who came with intention to purchase minutely inspected them,

handled them, made them jump, stamp with their feet, and throw out their arms and legs; turned them about; looked into their mouths; and, according to the usual rules of traffic with respect to cattle, examined them and made them show themselves in a variety of ways, to try if they were sound and healthy. The slave selected for purchase was marked with a piece of string, or of red or white tape, hung rouud his arm or neck.

In Berbice, on the contrary, the custom was to sell slaves by auction.

The fair being opened, and the crowd assembled, these unpitied sable beings were exposed to the hammer of public auction. A long table was placed in the middle of a large room, or logis. At one end was seated the auctioneer; at the other was placed a chair for the negroes to stand upon, in order to be exposed to the view of the purchasers, who were sitting at the sides of the table or standing about the room. All being in readiness, the slaves were brought in, one at a time, and placed upon the chair before the bidders, who handled and inspected them with as little concern as if they had been examining cattle in Smithfield market.

In both places, the price of boys or girls of from eleven to fourteen years was from 600 to 700 guilders, of women the price was from 700 to 800 guilders, and of men from 700 to 900 guilders.*

In both places too, the market day was regarded as a gala occasion. The townspeople, augmented by incomers from the country, dressed themselves in their finest clothes and determined to enjoy the day. Parents brought their young children to point the 'lucky finger at some black baby, who was then and there bought and destined to be brought up as the body-slave of the pointer. And the planters and others often brought their gaudily

* 600 guilders = £50; 900 guilders = £75.

dressed and giggling women-favourites, whose black or coloured skin indicated that they themselves had but recently been emancipated, or perhaps that they were even still slaves, to choose a slave to attend on their own persons. After such a market,

" a few of the most ill-looking only now remained, who were meagre, and of rough skin—not thoroughly black, but of a yellowish or dirty brown colour—of hungry, unhealthy aspect, feeble, of hideous countenance, and in general appearance scarcely human. These remained to a future day, and would probably be sold, not to planters, but to the boat-women, tailors, hucksters, or some of the inferior mechanics or shop-keepers of the town, at prices somewhat lower than that demanded for the more robust and well-looking; and alas, though least able to bear fatigue, these feeble beings would most likely be subjected to a far more heavy slavery than those of stronger frame, for it is commonly seen that the labour exacted by the poorer orders of the people from their few and weakly slaves is more severe than that required by the opulent planter from his regular and better appointed gang.

Another writer says that the Dutch planter who wished to frighten his slave could find no more effectual way of doing this than by threatening to sell him to a freed negro.

Very nearly all the labour of the colony was performed by the slaves. Of their agricultural labour I have already had occasion to speak and shall have yet further occasion. All domestic offices, too, were performed by slaves, and these not only of the necessary, but also of the luxurious, kind. The richer colonists even had slaves who stood behind them to beat off insects with sweet-smelling boughs of lime, and others were kept outside their doors at night, to be summoned, in case of need, to put an end to a troublesome mosquito, or to perform any similar service; and when such a colonist rode out, slaves ran by him, accommodating their pace to that of his horse. On one occasion PINCKARD 'met

two Dutch ladies upon the road, travelling in great state in a chair drawn by six naked slaves, instead of horses.'

Sometimes if the slave-owner had temporarily no personal occasion for the services of his slaves he prudently made money by them; for example, PINCKARD—

"was witness to a gentleman calling up one of his slaves into the breakfast room, and giving him orders to go with three others into the fields, the highways or the woods, and cut grass, to sell in the town, charging him to recollect that it was at the pain of a flogging if they did not each bring home four bitts* at night, and adding, by way of encouragement, that if they could gain more they might keep the surplus for themselves. They went out, each taking a long knife and a string, and they returned punctually in the evening with the sixteen bitts."

Other men owned gangs of slaves for the sole purpose of hiring them out to such persons as might temporarily require their services.

Up to this point the description of slavery which I have drawn from the letters of PINCKARD must have given almost unrelieved pain to the mind of the reader. But there was another, and a happier side from which the subject may be viewed. As in after times it happened that the evil which white men originally did in enslaving black men was, through an overpowering sense of this terrible side and a blind ignorance of this better side, crowned and made irrevocable by the harm white men wrought by their method of freeing these slaves, when, in a future chapter, I have to speak of this emancipation of the slaves it will be most useful to be able to refer not only to the worse, but also to the better side of slavery as it existed in the years of which I am now writing. Both sides are most vividly shown in many passages by PINCK-

* A bitt=5d.

ARD; and of these passages, I select the two following:—

"I know not, whether upon any occasion since my departure from England I have experienced such true and heartfelt pleasure as in witnessing the high degree of comfort and happiness enjoyed by the slaves of (Plantation) *Profit*. Mr. DARGAN* not only grants them many little indulgences and studies to make them happy but he generously fosters them with with a father's care; and they sensible of his tenderness towards them, look to their revered master as a kind and affectionate parent, and with undivided, unsophisticated attachment cheerfully devote to him their labour and their lives."

"Not satisfied with bestowing upon his slaves mere food and raiment, Mr. DARGAN establishes for them a kind of right. He assures to them certain property, endeavours to excite feelings of emulation among them, and to inspire them with a spirit of neatness and order not commonly known among slaves; and, I am happy to add, that the effect of his friendly attentions towards them are strongly manifested in their persons, their dwellings, and their general demeanour. Perhaps it were not too much to say, that the negro yard at *Profit* forms one of the happiest villages within the wide circle of the globe! The labouring poor of Europe can attain to no state adequate to such slavery, for, had they equal comforts, still they could never be equally free from care."

"The slaves are not only fed, and clothed, and tenderly watched in sickness, without any personal thought or concern, but each has his appropriate spot of ground and his cottage, in which he feels a right as sacred as if secured to him by all the seals and parchments of the Lord High Chancellor of England and his court."

"Happy and contented, the slave of *Profit* sees all his wants supplied. Having never been in a state of freedom, he has no desire for it; not having known liberty, he feels not the privation of it; nor is it within the powers of his mind either to conceive or comprehend the sense we attach to the term. Were freedom offered to him, he would refuse to accept it, and would only view it as a state fraught with certain difficulties and vexations, but offering no commensurate good. 'Who gib me for gnyhaam† Massa?' he asks, 'if me free, who gib me clothes? Who send me doctor when me sick?'"

* The owner.

† *Gnyhaam*, usually contracted into *nyam*, *i.e.* 'to eat.'

"With industry a slave has no acquaintance, nor has he any knowledge of the kind of comfort and independence which derive from it. Ambition has not taught him that in freedom he might escape from poverty; nor has he any conception that by improving his intellect he might become of higher importance in the scale of humanity. Thus circumstanced, to remove him from the quiet and contentment of such a bondage, and to place him amidst the tumults and vicissitudes of freedom, were but to impose upon him the exchange of great comparative happiness for much of positive misery and distress."

"The cottages and little gardens of the negroes exhibited a degree of neatness and of plenty that might be envied by free-born Britons not of the poorest class. The huts of Ireland, Scotland, France, Germany, nay many even of England itself, bear no comparison with these. In impulsive delight, I ran into them, surprising the slaves with an unexpected visit, and verily I say, the peasants of Europe might envy these dwellings of slavery. They mostly consist of a comfortable sitting room and a neat well-furnished bed-room. In one I observed a high bedstead, according to the European fashion, with deep matrasses, all neatly made up and covered with a clean white counterpane; the bed-posts, drawers, and chairs bearing the high polish of well-worn rubbed mahogany. I felt a desire to pillow my head in this hut for the night, it not having fallen to my lot since I left England to repose on so inviting a couch. The value of the whole was tenfold augmented by the contented slaves being able to say, 'all this we feel to be our own.'"

"Too often in regarding the countenance of a slave, it may be observed that

'Dark melancholy sits, and round her throws
'A death-like silence, and a dread repose.'

but throughout Mr. DARGAN'S happy gang the more striking features are those of mirth and glee; for here, the merry dance and jovial song prevail, and all are votaries to joy and harmony."

"Before the doors of the huts, and around these graceful dwellings were seen great numbers of pigs and poultry, which the slaves are allowed to raise for their own profit; and from the stock thus bred in the negro-yard the master usually purchases the provisions of his table, paying to the negroes the common price for what they would sell at the market. Were all masters kind and humane as Mr. DARGAN, slavery might have few enemies; and the peasants of Europe, amidst their boasted freedom, might sigh in vain for the happiness enjoyed by slaves!"

In regarding slavery as it existed in the time of PINCKARD not the least curious thing to us is the mental attitude toward the system of those white people who had been long accustomed to it. At the present day a strong prejudice against negroes, or to speak more accurately, against West Indian negroes, exists even in many educated Europeans, but it would probably be difficult to find any men in white skins who have, in any degree, that utter want of perception of any moral rights pertaining to a man in a black skin which prevailed among many, at least, of the planters of Guiana at the end of the last century. Nothing more clearly illustrates this odd state of feeling than certain stories told by PINCKARD of the habit of mind of the ladies of Guiana toward their slaves. For example, during a morning call on a lady in Stabroek, PINCKARD heard the slash of whips and cries of pain. 'The lady of the house,' he says, 'more accustomed to scenes of slavery than ourselves, pointing to the spot, as if it were a pleasant sight for strangers, or something that might divert us, asked with apparent glee, if we saw them 'flogging the negro?'' Thus called to the window the sight he saw in the open street was the not uncommon one of a wretched negro fastened face downward to the ground, his two legs tied to one stake, his two arms each extended and tied to another stake, flogged by two strong and armed drivers. But perhaps a yet more marked instance of this unwomanly callousness is to be found in the following annecdote:—

"A few days ago," PINCKARD writes, "I was applied to by the wife of a colonist to request that I would make some complaint against the slaves of the house to her husband, very humanely giving as a reason

for imposing upon me so grateful a task that she wished 'to get them a good flogging' . . . It was not even contended that any specific fault had been committed to justify the punishment, but this was to be invented, and merely because some idle whim, some fit of caprice or ill humour, had led the mistress of these poor slaves to wish them 'a good flogging'."

The feeling of the slaves toward their masters is equally worthy of consideration. If the white owner in those days had not as yet recognised any possible right of the negroes to freedom, the latter were at least equally ignorant and far from claiming such rights. If the bearing of the slave owners toward their slaves was cruel, the latter bore it as long as they could and then fled into the forest, where, banded together under the name of 'bush-negroes,' they lived a life of danger and great hardship, and were, as will presently be told, a constant source of danger to the colonists. On the other hand, kindness on the part of the owner had the effect of attaching his slaves to him with a bond of marvellous strength. We have already seen one case in which almost patriarchal kindness on the part of the master resulted in an almost idyllic state of happiness, content, and gratitude on the part of the slaves. Such cases were, however, not very common. But, very much more often, that lesser degree of kindness on the part of the master which ordinary humanity enjoined sufficed to win an almost doglike attachment from the slaves. One story from among several told by PINCKARD must serve to illustrate the matter.

At that time French privateers, manned by ardent republicans of the period, used to cruise off the coast of Guiana; and on one occasion, one of these ships having captured two small trading vessels belonging to the planters on shore, and manned by their slaves, three or four

sailors from the privateer were drafted into one of the slave prize-boats, to help to carry it to Trinidad.

"On the passage the Frenchmen talked much to the negroes about liberty, equality, and the rights of man, in all the common jargon of the revolution, holding out to them the high enjoyment of gaining their freedom, and assuring them that they would be carried from Trinidad to Guadeloupe, where they would be released from their slavery, become fellow citizens, and remain in future their own masters. But these poor blacks, having been treated with great kindness and humanity by their owners, and not having been bred in the modern Gallic school, could not be made to comprehend the fascinating doctrine of equality, and therefore perversely rejected the proffered French liberty; and instead of rejoicing, as it was supposed they would, to accept their freedom from the hands of these revolutionary republicans, they concerted a plan to rescue the boat and take it back to their masters; in which attempt they met with complete success, but unhappily it was attended with that savage inhumanity which characterizes the Africans. A little before they came in sight of Trinidad they seized an opportunity of rising upon the Frenchmen, and, not satisfied with subduing them, they murdered every one of them and threw the mangled bodies into the sea; then, like faithful slaves, they put the boat about, and made the best of their way up the coast, returning much pleased to their owners and to their task of slavery,"

There is a sort of rude pathos in the end of this story. Asked why they had killed the Frenchmen, instead of bringing them on shore as prisoners, these strange slaves made answer, 'Ah! Massa, me fraid 'em tell lies upon us, and people always believe Buckra* man sooner as 'Negro. . . so we tink it best for kill em all.'

The slave, knowing nothing better, lived contented with his slavery. "I have lately amused myself," wrote PINCKARD—

"by taking frequent opportunities of engaging in conversations with different negroes, both men and women, with the view of ascertaining what was the state of their intellects, and particularly what were

* *I.e.* white man

their sentiments with regard to the subject of freedom and slavery; and when I tell you that I was careful to select those who were most intelligent, you will be surprised to learn the very limited extent of their knowledge. Their utmost ambition does not go beyond the procuring of food, with the little clothing they wear, and medicine when sick; nor in any other view, do they seem to comprehend the advantages of freedom, and being assured of these from their masters while they remain slaves, they have a sense of terror at the idea of being made free. Yet I have remarked that some of the women speak in raptures on the subject of obtaining their liberty; but, upon further questioning them, I have always discovered that it was not from any just sense of independence, but from the mere desire of becoming the sultana of a white man and being placed by him above the ordinary slaves of his house. One such woman, questioned as to what she would do if she obtained freedom, answered 'den me live wid one Buckra man, and hab one slave to work for me,' and added that, if this white man died, 'den me live wid one other Buckra man.'

"Among those," continues PINCKARD, "who condemned freedom was a fine negro, who was born in the colony, and who speaks better English, and is more intelligent than most of the slaves who have been imported. This man insisted that he would not accept his freedom were it offered him, but that he would prefer to remain a slave. If free, he said, he must work for his food while he was young and when he should be old: whereas, if he remained a slave, his master would give him food for his labour while young, and let him eat and rest when he grew old. Also, if sick his master would let him have provisions, and find him a doctor; but were he free, he could not work for food when old or sick, nor could he have a doctor, because he should be unable to pay him. This country, he said, was good for him; he was born in it, and he would not like to go to any other. If he should have 'the misfortune' to be made free, he would learn some trade and work at that to procure him food and clothing. He had acquired some idea of a future state, and described it as a great and general principle among the negroes to cherish any of their own colour who had grown old and were in want, and to feed and compassionate them if they were free and unable to work: for which, he observed, they should 'go to heaven.' He had no doubt of being taken to heaven himself, and told me that he was ready to die that minute if any one would kill him, adding that he would rather die than live. On being

asked why he did not kill himself, he replied ‘ dat no good, if I sall do dat, me go to hell.’ Lying, swearing and drunkenness, he did not regard as crimes; suicide and giving poison to any person were in his estimation the greatest and almost the only sins. These he considered as certain of preventing any one from being received into heaven, of which his ideas were extremely vague and unintelligible. Hell he described as an immense cauldron of liquid fire into which the wicked were to be plunged."

Allusion has more than once been made to the relations which were common between planters and, probably other, white slave owners, and their women slaves. This is an unpleasant subject, into the details of which it is impossible to enter; and I should avoid it altogether but that these relations gave rise to what was even at that time an important class, and has since become one of the most important classes, of the population of Guiana. European women were still very scarce in the colonies; and thus white men were induced to associate with women who were not only black but slaves. This strange association was recognised throughout the colonies. Next to the deterioration which it inevitably wrought in the white men who were parties to it, its most important result was the production of the hybrid class of coloured people. Occasionally, incredible as it seems, the child of the black slave woman and her white master was regarded as the slave of his father; but gradually, a somewhat better state of feeling intervening, such children were brought up by the fathers as free mechanics and tradesmen. Thus arose the free coloured population, which in the time of PINCKARD chiefly formed the middle class,* between the slaves and their lords.

* I take this opportunity to point out, as emphatically as possible,

As against the white colonists, these free coloured people had rights not very far in advance of those of the black slaves. Any disrespect shown by a coloured man or woman to one of pure white blood, even if such disrespect consisted only in much provoked insolence, was, if not legally yet practically, punished by fine, imprisonment or even with degrading stripes. On the other hand it is curious to note that the coloured man or woman, however slight the proportion of European blood in his or her veins, looked down, in imitation so close as almost to amount to reproduction, of the feelings of the white man, upon the pure bred negro as an altogether inferior animal.

Another, and a very troublesome part of the free population of Guiana at this time was formed by the bush-negroes of whom mention has already been made. The origin of these people has already been described. They were slaves who had escaped into the forest, and they therefore retained their freedom only as long as they could keep out of the clutches of their former masters. The only life possible to these people in wild forests, in a land unknown to them, was one of such terrible hardship that only extreme cruelty and wretchedness had induced its adoption. The bush-negroes were therefore generally the most brutalized, embittered and revengeful of the negroes. Under chosen leaders, they resisted, and even attacked, both their former masters and the native Indians, and made for themselves fortified en-

the common error involved in using the word 'creole' of coloured people. The West Indian adjective 'creole' is rightly applied not necessarily to 'a coloured person' but to an individual, either of black, coloured, or purest white blood, or to an animal, *born in the West Indies.*

campments in the most impenetrable parts of the forest:—

"Having fixed upon the spot most convenient for their purpose, a circular piece of ground was cleared of its wood, and in the centre of this they built huts and formed the encampment, planting round about their buildings, oranges, bananas, plantains, yams, eddoes* and other kinds of provisions, thus, in addition to the trees of the forest, procuring themselves further concealment by the plantations which gave them food. . . . Round the exterior of the circular spot was cut a deep and wide ditch, which, being filled with water and stuck at the sides and bottom with sharp pointed stakes, served as a formidable barrier of defence. The path across this ditch was placed two or three feet below the surface, and was wholly concealed from the eye by the water being always thick and muddy. Leaves were strewed, and steppings similar in their kind, were made to the edges of the ditch at various points, as a precaution to deceive any who might approach as to the real situation of the path. But the proper place of crossing was found out by the acuteness of the Indians, who soon discovered that to attempt to pass at any other part was to be empaled alive."

From these forest strongholds the bush-negroes sallied out to rob the outlying parts of plantations; and, capturing every white man on whom they could safely lay hands, they found their revenge for old wrongs in mutilating, torturing and murdering him. The colonists practically found it impossible to follow into the forest and retaliate. In short the bush-negroes at this time formed an element of great danger to the colonies.

A few months before PINCKARD arrived in Demerara a party of Dutch soldiers had been sent into the forest to exterminate these troublesome runaways. But the negroes knew the forest so well that they surprised and defeated these troops, killing most and fastening their scalps and bodies to trees at the sides of the paths leading from the

* *i.e.* Calocassia, of various species, of which the roots are eaten.

plantations back into the forest, to serve as a warning to others.

A second expedition was composed of well-affected negro slaves and of native Indians. A reward of 300 guilders was offered for each right hand of a bush-negro. This was successful in breaking up all but one of the forest strongholds; and when the victors emerged once more from the forest, the weapons which they waved triumphantly over their heads carried seventy black human arms, and they brought with them large numbers of prisoners. Most of the ring-leaders were immediately tried, horribly tortured and then executed, the poor wretches bearing their cruel sufferings with the usual splendid fortitude of savages; one man more especially, one of the two actual leaders, suffered atrocities no whit less terrible than any that have made the name of ALVA notorious, with so great fortitude as to elicit from PINCKARD the quaint comment that

> "the conduct of this negro furnishes a striking example of the powers of the human will in subduing our bodily sufferings, and might seem even to corroborate the doctrine which maintains that all pain is ideal."

The second of the two leaders was fortunate enough to be reserved for punishment; and, as before that was awarded the colony was in the hands of the English, he died by the comparatively mild process of being first hung and then beheaded. Thus the bush-negroes were for a time scotched.

The Indians seem to have been in the same state, with one exception, as at present. The one point about them which, because it is no longer in force, does require mention is that it was the policy of the Dutch, not

only to make annual presents to them, but also to send Europeans to live among them as 'postholders' to gain their good will, and to collect and lead them when they were wanted for expeditions for slave hunting and other such purposes. We have already seen that at an earlier time, the Indians had been craftily used by the colonists, by playing on the mutual hatred of the tribes, to keep each other in check; so now they were used to keep in check the Africans, whom all Indians united in hating.

To complete the picture of the two colonies as PINCKARD saw them it is absolutely necessary to tell of the yellow fever which then, as long after, formed the greatest scourge and danger to Europeans in that country. The name of Guiana had in Europe long been suggestive chiefly of fever; but it was only about that time that the difference was first clearly recognized between the remittent fever, to which those long resident in the colonies were ever subject, and the far more terrible continued yellow fever which chiefly affected new comers. On the English occupation of the colonies in 1796 a large number of new comers, not only of soldiers but also of capitalists seeking a new field for business, poured into the place; and as was natural, a terrible epidemic of yellow fever before long broke out and rapidly increased among these. Gloom spread through the colony, so that men fell ill and died from very fear. Nor was it till long after this period that, chiefly by a much needed improvement in the drainage, such epidemics, which broke out each time that large numbers of new comers arrived in the colony, were checked.

The new comers at once began to change the colony for the better, and for the first time gave rapid movement

to the stream of progress which had flowed, with such exceeding sluggishness, for nearly three centuries. A large amount of fresh capital was introduced and invested in agriculture. Many of the old Dutch proprietors even at this period sold their estates to English speculators. The effect was at once seen in the improved cultivation of the fields, in the rapid substitution of sugar as a crop in place of the less remunerative, if less costly, cotton, and in the gradual replacement of the windmills, which till then had, when the wind blew, supplied the only mechanical power on the estates, by steam engines, which could be worked at will. The position of the slaves was also greatly improved. The fiendish, though partly unconscious, cruelty which had been possible in the remote, unregarded Dutch colonies was no longer possible now that these same colonies, in more energetic English hands, were brought into constant communication with the outer world. How great and sudden was the change in the feeling of the white colonists towards the negroes is sufficiently and startingly shown in the fact that within a few months after the English occupation many emancipated negroes were formed into a defensive troop for the colonies, to be called the South American rangers. The scenes to which the new dignity thus suddenly conferred on the negroes gave rise must have been striking in the extreme. One of them, the drilling of these same South African rangers, is amusingly depicted by PINCKARD. It must indeed have been hard work to drill these ex-slaves, so recently mere beasts of burden, into any military discipline. The non-commissioned officers were coloured men, of somewhat higher class, who, as usual, were even less

than Europeans inclined to humane treatment of black slaves, and less able to recognize the latter as fellow human beings. Even the Indians, who occasionally came down into the town, were for once moved to laughter, as they looked on at the drilling of the South American rangers.

But despite the apparent wildness of the scheme a genuine attempt was being made to turn these negroes to higher purposes than any for which they had yet been used. Officially the inferiority of the negro, real and imaginary, was ignored.

"It happened that two of the British soldiers, who were employed at the hospital, having been guilty of irregular conduct, were ordered into confinement; and, it being near, they were taken to the guard room of the Rangers, where, upon recovering their sober senses, they felt extremely shocked at their degraded situation in being prisoners under the bayonets of negroes, whom they had perhaps cuffed about as slaves, and were quite indignant on recollecting that the very men who were now put over them, even since their arrival in the colony, had toiled all day in the field, goaded as horses."

But humane and charitable as this movement toward improving the condition of the negro undoubtedly was, it was in the method of its execution unwise in the extreme. Suddenly to decree that slaves, who had not only been mere savages in their native homes, but who, since they had been torn from these homes, had been systematically degraded into animals far below the stage of culture which on the average prevails among savages, should have equal rights of freedom and self-government with men who, if not of any great degree of refinement, had at least been moulded by centuries of civilization, was then as absurd and impracticable as was the similar attempt which, in after years, took the form of the

abrupt and unprepared emancipation of all slaves. The Dutch colonists of Guiana, who, in PINCKARD'S time, derided and deplored the early phase of the movement, were not unprejudiced witnesses, but they knew the character of the negro better, and practically, if not theoretically, showed that they knew human nature better, than did their English rulers and fellow colonists. "We are told," says PINCKARD.

"that since the arrival of the English in these colonies the people of colour are grown unusually disobedient and even insolent, which is attributed to our being more lenient toward them than their Dutch masters. Whether or not this be admitted as the cause, it has happened that two very recent instances have occurred in proof of the fact, and which have made it necessary to use means of correcting their daring presumption."

Other improvements were also introduced at this time by the English. For example, the white colonists were formed into a militia for purposes of self-defence; church services were for the first time instituted in Stabroek, the one important centre of population in the colonies; and newspapers were established in Demerara and in Essequibo. In short, for six years the sister colonies advanced rapidly in prosperity, and became during the same time more and more saturated with English feeling.

Then suddenly, by the Peace of Amiens in 1802, these colonies were given back to Netherland rule, to the great consternation of the colonists, many of whom were by this time English by birth, many more, though Dutch by birth, were English in feeling. Just at that time the Dutch in Europe, suffering from a violent attack of republicanism, caught from their French neighbours, and having just rechristened themselves the Batavian Repub-

lic, had but little sympathy with the old fashioned Dutch colonists of Guiana, and had little or no patience with the friendliness of the latter for the English. Orders of recall came from Europe to VAN BATTENBURG, one of the two governors who had surrendered the colonies to the English in 1796 and had been allowed peacefully to retain his authority under the English; and a new governor with strong republican, and still stronger anti-English, feelings was sent out to replace him. The new governor did his best, not without considerable success to drive the English out of the colony, and in so doing brought nearly the whole business of the place to a stand-still. At last, in September 1803, to the no small pleasure of the colonists, an English fleet once more appeared before Demerara and Berbice, and finally placed the colonies under English rule.

*Cane Mills; and Megass as Fuel.**

By the Hon. W. Russell.

ACCORDING to the promise made when Mr. SHIELDS read his valuable paper on cane-crushing, I have now the pleasure of laying my views before the Society, coupled with certain detailed information gained from experiments made.

Mr. SHIELDS has been a trifle hard on the engineers who have hitherto supplied the crushing mills and engines for this colony, and he will find that there is a wide range between the makers.

While I am at one with Mr. SHIELDS in thinking that more power is called for to do anything like justice in reducing the enormous loss to which he has pointed in his paper, I cannot agree with him that cylinder enlargement alone is the one thing necessary.

Very recent experience on my part points to the absolute necessity of having strength all through the machine, an enlarged cylinder, with the same initial pressure of steam, having smashed up crank shafts, pinions, couplings, &c. I have in many instances seen an enlarged cylinder applied with marked success, where the engineer deemed it prudent to lower the boiler pressure from 75 to 50 lbs.; but an enlarged cylinder with the same initial pressure on the piston means mischief. I could instance many accidents due

* Paper read at the Royal Agricultural and Commercial Society's Meeting, January 10.

to increasing cylinder power—in particular at *Hampton Court*, where an enlarged cylinder gave out so much more power than the other parts of the machine was calculated to bear, that the crank shaft, 10 inches in diameter, got twisted, the fracture showing nearly the entire length of the bearing and rendering a new shaft necessary.

Mr. SHIELDS twits me with having drawn a picture of the evils due to the trash turner without having suggested a remedy! It is now fourteen years since I drew the attention of my brother planters to the waste of sugar due to bad extraction, and I then pointed out that in my opinion no single mill could be made to deal with such a rough subject as sugar-canes without a preliminary handling; the machine known as a "defibreur" was not then invented, but it has since been added to the long list of sugar patents.

Careful experiments left no doubt in my mind but that the cane, like a bloom taken out of the iron worker's furnace, required shaping down and that, after the first pressure, steam became necessary to soften the hard fibre forming the minute juice cells. A practical trial, in so far as I was concerned, settled the question. And the addition of boiling water to dissolve out the last fragment of sugar was simply a question of after-evaporation. And this brings me back to the opening clause of Mr. SHIELDS' remarks. In my early trials it was quite natural for me to do as Mr. SHIELDS has done, and assume that a certain per centage recovered was all gain from an *£ s. d.* point of view; but actual practice dispelled these bright visions, for it soon became patent that beyond a certain point the cost of evaporation

caused a dead loss. It is a well recognised fact that, cane juice marking 100° Soleil, or 1·63 pounds of sugar per gallon, and with crystals at 26/ to 28/ per cwt. in the English market, the juice is worth 3 cents per gallon. It then becomes a simple calculation as to what point it will pay to receive megass from the first mill and deluge it with water to extract the sugar contained in such megass.

In my early calculations, as may be found in "Sugar Growing and Refining" edited by Messrs. LOCK, WIGNER and HAARLAND, I fell into the fatal error of valuing cane juice without deducting the cost of making the said juice into sugar; this may be safely taken as fully one half. So that my early calculations require the following corrections; the original calculation is thus:—

3½ lbs. of sugar at 5 cents (2½d)	=	17·5 cts.
6 „ of coal at $6½ (27/) ℔ ton	=	1·8 „
Difference in favor of coal	=	15·7 „

taking into account the cost of manufacture of 3½ lbs. at 6c. the calculation will be as follows:—

3½ lbs. of sugar at 5c. (2½d) = 17-5 less 6c.	=	11·5c.
6 „ of coal at $6½ (27/) = per ton	=	1·8c.
Difference in favor of coal *v.* sugar	=	9·7c.

When this is taken all into account, the sugar planters cannot be accused of throwing away those fabulous sums of money which their detractors charge them with because of faulty crushing; all such sums may safely be halved. I quite grant that the loss is great and calls for close watching; and this I think the table which I now lay over sufficiently proves.

TABLE A.

Plantation.	100 Canes.			100 Green Megs.			Work of Mill.				Total available Carbon in Green Megass per cent.	Heat units per pound of Green Megass.	REMARKS.
	Fibre and Ash.	Total Sugar.	Water, &c.	Water.	Sugar.	Fibre and Ash.	Juice in Canes per cent.	Juice expressed per cent.	Juice lost in Green Megass per cent.	Canes required to make 100 Green Megass.			
Anna Regina...	11·70	14·00	74·30	45·20	8·51	46·29	88·30	74·71	13·59	395	27·18	3507	Double Crushing and Maceration
Maryville......	13·27	14·32	72·41	50·72	10·04	39·25	86·73	66·14	20·59	295	24·23	3127	Single Crushing
Philadelphia	12·98	15·50	71·52	51·42	11·14	37·44	87·02	65·31	21·71	288	23·78	3066	do. do.
Tus. de Vriend.	13·10	14·51	72·39	54·16	10·85	34·99	86·90	62·56	24·34	267	22·36	2884	do. do.
Zeelugt..........	13·21	15·62	71·17	57·14	12·54	30·32	86·79	56·35	30·42	229	20·73	2675	do. do.
De Willem......	12·92	14·19	72·89	55·42	10·79	33·79	87·08	61·72	25·36	261	21·76	2808	do. do. [Canes on second mill
Uitvlugt...... ...	12·80	13·95	73·25	49·60	9·44	40·96	87·20	68·75	18·45	320	24·88	3207	Dbl. Crshng. and M'cration., thin feed of
Leonora..........	12·10	13·90	74·00	48·03	9·02	42·95	87·90	71·83	16·07	355	25·69	3315	Double Crushing and Maceration
Cornelia Ida ...	13·11	17·37	69·52	49·71	12·42	37·87	86·89	64·78	22·11	281	24·53	3165	Single Crushing
Diamond.........	13·48	12·73	72·29	50·30	8·87	40·83	85·02	66·98	19·54	302	24·55	3168	do. do [presses 66 per cent
Providence......	11·40	13·37	75·23	42·70	7·59	49·71	88·60	77·07	11·53	436	28·54	3683	Dbl. Crshng. and Maceration, first mill
La B. Intention.	11·30	13·83	74·87	56·10	10·36	33·54	88·70	66·25	22·45	296	21·46	2769	Double Crushing and Maceration.
Rose Hall.... ...	13·30	14·74	71·96	51·13	10·47	38·40	86·70	65·32	21·38	288	23·98	3095	Single Crushing
Port Mourant...	12·10	15·82	72·08	54·62	11·98	33·40	87·90	63·77	24·13	276	22·07	2848	do. do.
Skeldon...... ...	12·40	13·03	71·57	55·83	12·51	31·66	87·60	60·80	26·80	255	21·41	2763	do. do.

J. OWEN ALEXANDER.

It will be found that this table embraces the information gained by an exact analysis of the canes and resultant megass, and if there are any points in connection with the tabulated information wanting elucidation I shall be happy to furnish such.

I have only to add that I believe where the duty is fairly divided over two such mills as those to be seen at *Providence* the trash-turner question has been reduced to a minimum.

Still, with more than one top roller gudgeon wrung off, I am inclined to think that there is room for improvement, and as I have already pointed out,—a two roller mill on the De Morney type seems to me the most likely remedy.

Let us refer to Table A. and take the work done by the two plants with which I am most intimate, viz: *Providence*, which I consider almost perfect, and *Tuschen*, which I consider a fair average. On the former estate the first mill exerts an indicated power of 117 horses to give an expression of 66 per cent. from the cane, and makes 85 hhds. of 2000lbs. net per week.

The second mill, which receives the megass steamed from the first mill and by which 11·07 per cent. from the cane is gained, making in all 77·07 per cent. absorbs the indicated power of 127 horses and adds 15 hhds. to the week's work or in gallons cane juice at 100° Soleil 30,000, which on the same valuation as I pay the farmers for the juice contained in their raw canes, represents $900 gained per week's work. I say gained, because the increased value of the megass as fuel, as we shall see later on, more than pays for the additional power required to extract the juice out of the megass

as compared with the cane; there is also saving in handling megass against canes.

At *Tuschen* with a small single plant the indicated power is 63 horses and the crushing is 62·56; the week's make, 70 hhds. Reducing this to the horse power per hogshead per week under the varying extractions we have

				crushing
Tuschen	·85	H.P. per hhd.	with......	62·56
Providence	1·40	do. do.	do.......	66·00
„	2·44	do. do.	do.......	77·70

Thus if I want to increase my extraction at *Tuschen* to be equal to *Providence* first operation 3·5 per cent additional, it will be necessary to increase the power 55 o/o, and to come up to the final results at *Providence*, calls for almost exactly 3 times the present power.

Mr. Shields is under the impression that it is simply a question of applying power, when at one operation the same expression might be gained as at two. That is to say that if the combined power, 244 horses, were applied to a mill of sufficient strength, the same 77 per cent. could be extracted. I join issue with him on this point, as from all the experiments that I have made with what is called dry double crushing, I have never been able to get beyond 68 to 69 per cent. In other words when 68 to 69 per cent. has been extracted and the megass is again passed through the same mill, more firmly braced up, the result is *nil*.

I am entirely at one with Mr. SHIELDS with regard to the new hydraulic mills introduced by Mr. DUNCAN STEWART the well known engineer of Glasgow, for keeping the rollers up to their work; for a safety valve was undoubtedly required to afford relief under unnatural strains. Every one who has had to

attend to sugar-crushing machinery must be aware of the great relief given to the machinery by backing the pinching screws $\frac{1}{16}$th of an inch, with a corresponding falling off in the quality of the expression—$\frac{1}{8}$th of an inch being quite equal to a falling of, with the same feed, of 5 per cent. Now with hydraulic pressure you have all this give and take, insuring the same rate of crushing when an undue feed is by any chance brought to bear on the mill, while with the normal feed the mill again closes up to its work.

An erroneous opinion has been advanced that this application of resistance requires less power to drive the same mill, as against resistance by a screw. To gain the same end the power must be exactly the same; and although I have not an indication from the *Success* engine, where this new system is now to be seen at work, with a small feed passing through the rolls giving 68 per cent. crushing, I venture to predict that the power exerted is fully 2 h. p. per hhd. per week to gain above result.

I now come to the question of which I gave notice at last meeting, "The Sugar Cane as Fuel."

The question of fuel to us, who have to pay on an average $7 per ton for coals laid down at our works, is an important one, and I mean in this paper to lay before you the absolute value of an ordinary sugar cane as an article of fuel and to trace out the various stages at which it pays to use it as such. The cane before you is built up of three parts, or more properly, from a fuel point of view, two, carbon and water. A quantitative analysis of this cane gives :—

Sugar and solubles	18	
Fibre and ash	12	
Water	70	—100

Now if we were to take a heap of these canes and attempt to burn them we should assuredly fail. Still when we look at their composition, say:

Sugar 18 @ 42·1 o/o carbon......	7·58
Fibre 12 @ 50 o/o carbon	6
	13·58

we have 13·58 lbs. carbon, which would, if consumed in a suitable furnace, evaporate twice the combined water held in the sugar cane.

This clearly establishes the important fact that although carbon may be in such excess in the composition of any given substance as completely to consume the other parts, it becomes absolutely necessary, in the first place, to separate the elements.

This brings me to the important question of burning green megass at a profit.

We have seen that the sugar cane, as a whole, cannot be made even to consume itself, we have, therefore, in a practical paper like this, to lay our experiences before our brother planters, as to the exact degree of extraction by the crushing mills at which it will pay to take the megass direct from the mill to be consumed as fuel.

In the *Sugar Cane* of July 1st, 1882, Mr. N. LUBBOCK treats the readers to the most exhaustive and best essay that I have come across on this same question of megass as fuel, and so staggered was I with the finding arrived at, that I became curious to work out the actual figures—as I could not believe, judging from my own experience, that the conclusion agreed with my observations. I find that Mr. LUBBOCK fell into the same error that I have

more than once dropped into, and misplaced his decimal points; thus, on page 357, the units of heat to be deducted under the "Air for Wood" is stated at 4495, this should be 44957, so that on page 359 the units of heat available in 100 lbs. of megass in its green state will be as follows:

100 lbs. wet megass......................	117,889	available	units.
Resultant weight of above sun-dried	184,889	,,	,,
Do..............logie	146,788	,,	,,

This not only changes his finding in so far as carbon is concerned, but, as I have already pointed out, the relative positions of carbon and water contained in any given substance is very material as to whether they can be made to burn or not, and this is the all important point to be arrived at in the now pressing question of burning green megass at a profit. What is the expression at which it will pay to burn this?

On the *Leonora* estate I am fortunate enough to have a variety of furnaces, so that I can practically experiment upon megass at all stages.

Furnace No. 2 is a simple oven furnace in front of a tubular boiler 12 feet long, 7 feet diameter, with 96 4-in. internal tubes giving a heating surface of 1152□′ and was first brought to my notice by the late Mr. TAIT of MIRRILEES and TAIT when on a visit to the colony early in the sixties. Mr. TAIT was forcibly struck with the large duty done by our copper walls and tubular boilers attached in taking up the waste heat; and among other suggestions he recommended feeding by hopper, so as to exclude the rush of cold air which took place when the fireman stooped down to lift a fresh armful of megass; this was done with excellent results. And following up

the combustion of megass under boilers, with a view of doing away with the—to him—unsightly copper walls he sketched an oven in front of a tubular boiler, almost, exactly the same as the chamber in front of the first taiche of a copper wall, or what is known as a Jamaica train. Mr. TAIT, in 1866, furnished a boiler for *Leonora,* which was set according to directions, 25 feet grate surface, and the result from both megass and coals exceeded my most sanguine expectations. The original boiler was only taken out the other day, and has been replaced with the present one on the same lines; and with a view of trying conclusions between green and logie-dried megass fed in the furnace of this boiler, I had an almost exact duplicate boiler hung alongside of the other, on COSTER'S principle, for megass from the mill.

No. 1.—COSTER'S principle 42□′ fire grate to a boiler 10′ x 7′ with 104 4″ tubes=1042 H.S.

No. 2.—TAIT'S principle 25 □′fire grate to a boiler 12′ x 7′ with 96 4″ tubes=1152 H.S,

Being No. 1,—25 H Surface to 1 fire grate.
No. 2,—46 ,, ,, ,, ,,

The trial lasted over 3 hours and was carefully watched by Mr. HERIOT, the estate's engineer, and by Mr. ALEXANDER, the analytical chemist from *Tuschen.* To both of these gentlemen I am deeply indebted for the interest taken and assistance given, in an attempt to solve the important problems now under consideration. I call it an attempt; because I am well aware that to arrive at correctness further experiments are called for, and I trust that, having set the ball rolling, others will join in. I also take this opportunity of thanking the gentlemen connected with the various estates for the

liberty given to test their canes and duty of mills as set forth in Table A.

No. 1 was fired with megass from the mill carrying 48·03 per cent. of combined moisture. In three hours 6,237·125 pounds of megass was burnt, evaporating 113·921 cubic feet of water into steam at an average pressure of 50 lbs. above atmosphere; ∴ $\frac{7120}{6237}$ lbs. feed water = 1.14 pounds feed water to one lb. of green megass and $\frac{114}{3}$ hours cubic feet = 38 ÷ 42 grate = ·9 of a foot of feed water per square foot of grate, and 49·5 pounds megass per □′ grate per hour.

No. 2 was fired with megass from the logie containing 18·86 of combined moisture. In three hours 4,256·75 pounds of megass were burnt, evaporating into steam, at an average pressure of 50 lbs. above atmosphere, 106·456 cubic feet of water.

∴ $\frac{6653}{4256}$ = 1·56 feed water to 1 megass and 106 ÷ 3 = 35·3 per hour ÷ 25 furnace = 1·4 per foot grate of grate and 56·7 pounds megass per □′ of fire grate per hour, comparing the duty done, with the theoretical, proverbial □′ foot of grate to cubic foot of feed water, both furnaces gave a fair amount of duty. It is at once apparent that in dealing with these samples of fuel it is necessary to provide 50 per cent. more fire grate than when firing with green megass.

ANALYSIS OF MEGASS.

			Carbon.
No. 1 Green	Fibre............	42·95 =	21·47
	Sugar............	9·02 =	3·79
	Water...........	48·03	
		100	25·26

Evaporation 114 lbs. feed water.
48·03 combined water.

25·26) 162·03

6·4 lbs. water to 1 carbon
Useful effect.

25.26) 114

4·5 feed water to 1 carbon
5040 heat units.

			Carbon.
No. 2. Logie Megass	Fibre...	81.14 =	40.5
	Water..	18·86	
		100·	40·5

Evaporated ... ...156 lbs feed water.
18·86 combined moisture.

40·5) 174·86

4·3 pounds water to 1 carbon
Useful effect.

40·5) 156

3·85 feed water to 1 carbon = 4,612
heat units.

As it is the useful power given off by the carbon that we have to deal with, we have:

Green megass...4·50
Logie megass...3·85

0·65

or 17·0 per cent. in favour of the green megass. Taking the total duty done by the pound of carbon as contained in the green megass we have 6·4 × 11·20 = 7,168 units of heat against the theoretical 11,200 units, more correctly 12,906 Duplong or 14,040 Despretz. This points to a very fair duty

done in the furnace; the pity is that so large a waste is necessary to get rid of the combined water.

As it has been asserted that the contained sugar left from bad crushing is more than enough to drive away the combined water, in fact that badly crushed megass makes better and stronger fuel than when the straw has been denuded of all its sugar, I made a few trials on the same furnace, No. 1, with megass from the first mill, with 56 per cent. crushing. The fuel used contained per 100:

Sugar	12	= 5·04	Carbon.
Fibre	24	12·	"
Water	64		
	100	= 17·04	

Taking this carbon and multiplying by 4·5, we have from the value of green megass as ascertained above, 76·68 pounds of water, which *pro rata* this carbon ought to eliminate, leaving 12·68 only for useful effect; instead of this being the result, although the fire brick furnace was a cherry heat when the stoking commenced, in less than a quarter of an hour the furnace turned black, combustion ceased, and the fuel simply smouldered.

At *Rose Hall*, Berbice, with the crushing at 65·32 per cent: the figures are

				Carbon.
Megass.—	Fibre	38·40	=	19·20
	Sugar	10·47		4·40
	Water..........	51·13		
		100		23·60

As compared with *Leonora* we have:

	Carbon.		Water.
Leonora	25·26	&	48·08
Rose Hall...........	23·60	&	51·13
	+ 1·66		− 3·10

This surplus of carbon 1·66, with diminution of 3·10 of water in the *Leonora* megass, as against *Rose Hall* makes the difference between success and failure, and I am now persuaded that to burn megass from the mill successfully calls for at least 70 per cent. extraction from the cane.

The following calculation will explain the position of *Providence* with 77 per cent : crushing of its canes :

For juice extracted.	For fibre.	For sugar.	For total juice.
2240 lb. canes.	2240	2240	2240
77·07	11·40	13·37	88·60
1726 lb. juice.	255·3600 fibre.	299·42	1984·6406

			lbs.
15·7	sugar in juice...	Total juice in 1 ton canes	1984·64
258.90	extracted.........	extracted	1726·30
299·42	total..............	combined in megass........	258·28
40·52	in megass........	add actual megass.........	255·36
258·28	juice in megass	green megass................	513.64
			Carbon.
217·76	water in megass	megass fibre 255·36...... =	127·68
		Sugar 40·52... =	17
		Water 217·76	
258·9	sugar extracted.		
72	o/o in dry crystals.		
		Tons.	Carbon.
186·408	dry crystals.....	Ton sugar ......513·64 =	144·68

2240 ÷ 186·40 ÷ 12 tons canes regd per ton Sugar.

OFFAL CROP.

	258·9	pounds sugar extracted.
	186·4	dry crystals.
	72·5	offal crop.
	12	times to ton of sugar.
lbs. sugar to gall rum 20	870·0	
	43·5	gals. rum per ton of sugar.

1 ton canes...............		2,240
In fibre.....................	255·36	
Sugar as	40·52	
Dry sugar.................	186·40	
Double for massécuite	186·40	668·68

Water to get rid of (2,240−668·68 pounds=1,571·32) to do which are available 144·68 pounds of carbon.

Taking the available carbon, 144·68 pounds, and allowing the coefficient derived from the *Leonora* trial, viz. 6·4 water to 1 carbon, we have

$$\begin{array}{r} 144{\cdot}68 \\ 6{\cdot}4 \\ \hline 925{,}952 \end{array} \qquad \begin{array}{r} 1571{\cdot}32 \\ -\ 925{\cdot}95 \\ \hline 645{\cdot}37 \end{array}$$

left to be eliminated by coal or wood; and as *Providence* consumes 1800 lbs. of coals to the ton of sugar, with the equivalent of rum, in addition to the megass for all purposes, the consumption will be considered extravagant by those who have arrived at such perfection as to do all the work by megass alone. At the same time I cannot put my hand upon any glaring waste in *Providence* works.

These, gentlemen, are my views upon cane crushing machinery and upon cane in its various stages as

fuel. But by the time that some of my fellow planters have laid their experiences before the Society, I may be in a position to add a trifle to the present.

COMPARISON BETWEEN TUSCHEN AND PROVIDENCE GRINDING.

If *Tuschen* canes were ground at *Providence*—

2240	2240	2240	2240
77·07	13·10	14·51	86·9
1726 lbs. juice.	293·44	325·02	1946·56

16·7 Juice in Cane

288·242 Sugar Extracted
325·02 Total Sugar

26·77 Sugar in Megass
220·56 Juice in Megass

183·76 Pounds water in Megass

Total Juice in a Ton of Canes
1648·56 lbs.
1726· Extracted

226·56 Left in Megass
293·44 Actual Fibre.

314·00 Green Megass

			Carbon
∴ We have Megass Fibre	293·44	=	146·72
Sugar as Megass	36·77	=	16·44
Water do.	183·79	=	
	514·00	=	162·16

Sugar Extracted 288·242
72

207·5 Dry Crystals ÷ 22·40 = 10·8
[Per Ton Sugar Tons Canes

Ton Canes		2240 lbs.
Less Fibre	293·44	
Sugar in do.	39·77	
Dry Crystals	207·54	
Double for Massecuite	207·54	754 29
Water to be got rid off...		1,494,71

Offal Crop

Sugar Extracted	288·24
Dry Crystals......	207·54
Offal............	80·70
Tons Canes to +	10·8
	20)871560
	43·5 Gallons Rum

"TUSCHEN WITH 62·56 PER CENT. CRUSHING.—SHEWING ADVANTAGE OF RICH JUICE AND HEAVY WOODY FIBRE, MANUFACTURED AT PROVIDENCE.

For juice extracted.	For fibre.	For sugar.	For total juice in cane.
2240	2240	2240	2240
62·56	13·19	14·51	86·9
1401·3440 lbs Juice.	293·4400 fibre	325·0240	1946·560

16·7 per cent. sugar in juice.

		Total juice in a ton of canes.	
233·979	sugar extracted.	1946·56	
325·02	total sugar.	1401·34	extracted.
91·04	sugar in megass	545·22	left in megass.
545·22	juice in megass	293·44	actual fibre, &c.
454·18	lbs. water in megass.	838·66	green megass.

∵ We have megass fibre	293·44	= 146·72	canes.
Sugar	91·04	38·23	„
Water	454·18		
	838·66	= 184·95	

Sugar extracted.

234
72 o/o in dry crystals.

168·48 ∵ 2240 ÷ 168·48 = 13·3 tons canes to 1 sugar.

		lbs.
1 Ton canes..........................		2240
Less Fibre..........................	293·44	
Sugar in Megass.................	91·04	
Dry Crystals	168·84	
Double for Massecuite	168·48	
		721,44
Water to get rid off.............		1,518·56

OFFAL CROP—

Sugar Extracted..................	234
Dry Crystals......................	168·48
Offal................................	65·52
Tons Canes to 1 Sugar	13·3
	20)871·416
	43·5 gals. rum per ton sugar.

Thus it will be seen that if the same canes which required 13·3 tons to make the above quantity of sugar at *Tuschen* had been ground at *Providence* 10·8 tons would have sufficed or say

Tuschen	Working	13·3	Tons Canes
Providence	do.	10·8	
	10·8)	2·5	
			23 per cent in favour of *Providence*

13·3 Ton Canes	at \$4	53·20
10·8 do.	at \$4	43·20
		\$10 per Ton of sugar in favour of *Providence.*
		100 per Week
		\$1,000 against \$900 as per value of Juice [calculation.

In other words the difference in richness of Sugar in Canes between 13·37 and 14·57 = 1·14 per cent. means a gain of \$5 per ton of sugar made, a point well worth the attention of cane cultivators. The Beet growers have given us a lesson in this direction and it is our duty to follow.—

The following calculations will clearly show &c. &c.

PARTICULARS OF SUGAR CRUSHING MACHINERY.

TABLE "B."	Leonora.	Uitvlugt.	De Willem.	Zeelugt.	Tuschen de Vrienden.	La Bonne Intention.	Providence.	Diamond.
Analysis of steam in boilers	70lbs.	80lbs	55lbs	53lbs	55lbs	60 lbs.	60 lbs.	40
Condensing engine, diameter of cylinder	26 ins.	—	—	—	—	—	—	26
" " length of stroke	42 "	—	—	—	—	—	—	54
" " vacuum	24 "	—	—	—	—	—	—	25
" " number of revolutions	42 "	—	—	—	—	—	—	30
o. 1 High pressure engine, diameter of cylinder ...	22 "	21	20	18	21	24	22	—
" " " length of stroke ...	48	42	42	42	42	48	48	—
" " " back pressure	15lbs.	15	15	15	15	8	10	—
" " " number of revolutions ...	38 "	31	41	36	38	26	35	—
No. 2. " " diameter of cylinder ...	18	24	—	—	—	21¾	24	—
" " " length of stroke ...	42	48	—	—	—	36	48	—
" " " back pressure	15	15	—	—	—	8	10	—
" " " number of revolutions ...	40	35	—	—	—	36	32	—
Diameter of rolls in inches Mill No. 1	31	24	26	26	26	32	30	32
Length " " " " No. 1	66	54	60	54	54	72	66	66
Diameter " " " " No. 2	22	32	—	—	—	28	32	—
Length " " " " No. 2	56	72	—	—	—	60	72	—
Diameter " " " " No. 3	29	—	—	—	—	—	—	—
Length " " " " No. 3	54	—	—	—	—	—	—	—
Speed of periphery of rolls in feet per min., Mill No. 1	19·6	15·0	21·5	20	20	13·2	18·8	23
" " " " " " No. 2	19·9	18·3	—	—	—	13·2	18·7	—
" " " " " " No. 3	24·7	—	—	—	—	-	—	—
Diameter of Crank Shaft No. 1	7⅛	5⅛	7	6¾	6¾	9	8½	10⅛
" " " " No. 2	8¼	8¾	—	—	—	6½	8¾	—
" " " " No. 3	6¾	—	—	—	—	—	—	—

„ „ „ Journal of Mill Gudgeon	No. 1	12½ top 10¼ side	9	10	10	10	12	12¼	12¼
„ „ „ „ „ „	No. 2	13	13	—	—	—	10	14	—
„ „ „ „ „ „	No. 3	11½	—	—	—	—	—	—	—
Length „ „ „ „ „	No. 1	13 top 10½ side	12	13	13	13	16	10	13
„ „ „ „ „ „	No. 2	16	16	—	—	—	12	16	—
„ „ „ „ „ „	No. 3	15	—	—	—	—	—	—	—
Pitch of Teeth. Mill Pinions „	No. 1	4½	4	4¼	4½	4½	5	5¼	4½
„ „ „ „ „ „	No. 2	5	5	—	—	—	4⅝	5	—
„ „ „ „ „ „	No. 3	5¼	—	—	—	—	—	—	—
Face of „ „ „ „ „	No. 1	13½	11	10	10¼	11½	15	14	13
„ „ „ „ „ „	No. 2	15	15	—	—	—	10½	15	—
„ „ „ „ „ „	No. 3	12	—	—	—	—	—	—	—
Shrouded or plain teeth „ „ „	No. 1	½ Shrouded	Plain	½ shrd	½ shrd	½ shrd	½ shrd	½ shrd	½ shrd
„ „ „ „ „ „	No. 2	„ „	½ shrd	—	—	—	½ shrd	½ shrd	—
„ „ „ „ „ „	No. 3	„ „	—	—	—	—	—	—	—
Material of Pinions „ „ „ „	No. 1	Steel	Iron	Iron	Iron	Iron	steel	iron	Mix. *
„ „ „ „ „ „	No. 2	Steel	Steel	—	—	—	steel	steel	—
„ „ „ „ „ „	No. 3	Iron	—	—	—	—	—	—	—
Number of Revolutions of Engine to one of „	No. 1	17·33	3·	13·0	2·33	12·33	16·47	17·5	12
„ „ „ „ „ „	No. 2	16·00	11·9	—	—	—	15·27	16·0	—
„ „ „ „ „ „	No. 3	12·33	—	—	—	—	—	—	—
Total Fire grate surface Boilers	...	259·25	242	91	63	66	127	132	70
„ Heating „ „	...	———	—	—	—	—	—	1712	—
„ Fire grate Copper-walls... ...	...	106·5	50	32	32	32	48	60	28
„ „ „ Vacuum Pans.. ...	...	1250	870	325	250	400	747	822	500
Juice extracted per hour in gallons... ...	...	4000	2400	1550	825	1700	2308·4	2250	1700
Dry Sugar „ „ cwts	...	41·5	23·2	16·0	12	13·3	16·1	21·68	17
Gallons of Rum per ton sugar	...	30	41·1	39·0	20	50·0	53·9	40·7	30
„ of Molasses sold per ton sugar ...	...		5·0	13·1	16	7·9	6·7	3	—
Cwts. of Coal per 1000 galls. juice	...	11·3	10·6	8·5	9·17	9·25	13·0	9.01	10
If Stills are worked by direct fire or steam ...	...	Steam	steam	steam	steam	steam	steam	fire	fire
„ „ „ „ single or interment ...	...	Intermittent	inter.	inter.	single	single	nter.	single	single

* Mixture of iron or steel.

The Mountains of the West Indies

By T. P. Porter.

BETWEEN Yucatan—which forms the southern horn of the Gulf of Mexico, and the delta of the Orinoco—the most northern of the principal rivers of South America, lies the West Indian archipelago. This consists of a complete chain of islands, the natural beauty of which is unsurpassed, varying as it does from the sublimity of Switzerland's alpine grandeur, to the soft loveliness of Italy's sunny plains. In the following pages it is our purpose to embody a general physical description of these islands, confining ourselves principally, however, to their mountains. But a brief politico-geographical description may not prove an altogether useless preface.

As may be seen by a glance at the map of Central America and the West Indies, the latter are divided naturally into two distinct portions. First of these we have the Greater Antilles. The long, curving island to the left is Cuba, the principal colony of Spain, often spoken of as the "Queen of the Antilles." It curves away to the eastward from the entrance of the Mexican gulf some 370 miles. South of Cuba is Jamaica, one of England's oldest and most important West Indian colonies. To the east of these lies the island of Hayti, which, it will be observed, is divided into two countries—Hayti and St. Domingo. The former was once a French colony, and the latter a Spanish, but they are now inpependent states, under so-called "republican" forms of

government. They are inhabited almost solely by negroes. Farther to the east is Porto Rico, another Spanish colony, with its dependencies Vieque and Culebra. Here the Greater Antilles end. North of Cuba and Hayti, slanting north-westerly towards the coast of Florida, extends the system of low-lying islands, rocks, coral reefs, and sand banks, known as the Bahama Islands. These belong to England.

The second division consists of the Lesser Antilles, or Caribbees, which are subdivided into the Leeward and Windward groups. The former comprises the Virgin Islands—which are, St. Thomas, St. Croix, and St. John, Danish ; Tortola, Virgin Gorda, Anegada, and many rocks and islets, British ; and Anguilla, St. Barths, St. Eustatius, St. Martin, Saba, St. Kitts, Nevis, Montserrat, Antigua—the seat of the Leeward Islands government,—Barbuda, Guadeloupe, Marie Galante, and Dominica. Of these, part of St. Martin, St. Eustatius, and Saba are Dutch ; part of St. Martin, Guadeloupe, and St. Barths are French, and the others British, forming, along with the Virgin Islands, the Confederacy of the Leeward Islands. The latter, or Windward group, comprises Martinique, St. Lucia, St. Vincent, Barbados—the seat of the windward Islands government,—Grenada, the Grenadines, and Tobago. Of these Martinique is French, and the others, to Tobago, British, forming the Windward Islands government. The Island of Trinidad is also British, but a separate colony.

The extent of the archipelago north and south is from the Tropic of Cancer to the 10th degree of north latitude ; and east and west from about the 60th to the 85th degree west longitude. The Atlantic ocean

lashes the bold and rocky outer coasts of the islands, whilst the gently sloping inner shores are laved by the generally peaceful waters of the Caribbean. Sometimes, however, this quiet "summer sea" is swept by the devastating cyclones which circle round the tropics between the months of July and October, in an hour or two spreading desolation and death where all was prosperity and happiness.

Although many of the West Indian towns especially those of Trinidad, are excessively warm during the greater part of the year, owing to their being built on the leeward shores and for the most part enclosed by high mountains, the climate of the islands is rather mild than otherwise, the range of the thermometer being between 71° and 82° Fahrenheit. One unbroken summer prevails throughout the year, which is, however, divided into four seasons—two wet and two dry. The dates of the beginnings and endings of these seasons vary according to the positions of the islands. Sometimes the wet seasons are accompanied by malarial fevers, especially in the low-lying or marshy districts; but on the whole the health of the West Indies may be said to be good. The old prejudice that so long obtained credence as to the West Indies being the "European's grave," is now passing away and being relegated to the level of a nursery fable. It is an easy matter to invest the unknown with a dark veil of terror, and hence the dread of West Indian "fever." But as these colonies have become better known, the fancy has steadily if slowly yielded to the fact, and Englishmen begin to regard the dreaded climate in its true character. We do not deny that many a promising young colonist

speedily finds a premature grave, but his successful brother can tell a tale that may exonerate the vilified climate if he be minded to candour.

A chain of mountains rises in Cuba, and traverses the island from west to east, where it is lost—apparently, however, to rise again in the islands to the east. It seems to us that, with the exception of one or two breaks which occur in the out-lying islands, one system of mountains runs throughout the West Indies, plunging as it were from the precipitous coast abruptly into, or from the lawn-like slope slowly gliding beneath the blue waters, to rise again in like manner and, clothed with perpetual verdure, trend upward some hundreds or thousands of feet, only to again disappear and reappear.

It is, we believe, very generally considered by geologists that the West Indian islands were at some prehistoric period united with each other, and joined the American continent at both ends of the chain. What is now known as the Caribbean, would thus have been a large inland sea, even though considerably smaller than it at present is. Admitting this theory to be tenable, we come to the likelihood that what now constitute the "islands" were the topmost peaks and ridges of a chain of mountains thrown out from the greater chain which traverses the American continent from its north western shores to Cape Horn. Some stupendous convulsion of nature, far exceeding that which has recently occurred in Java, would sufficiently account for the change. Of the existing indications of former tremendous volcanic activity, which are to be found in the islands, we will speak in the proper place. Meanwhile we will trace this broken mountain-chain through its many windings and

disappearances, dwelling, as occasion offers, on the wild magnificence or soft beauty disclosed to our contemplation.

In Cuba, as we have said, the chain traverses the greatest length of the land, keeping well in the centre. Spurs are, however, thrown off in several places, reaching to the sea in bold, rocky headlands which, coupled with the coral reefs and innumerable islets that are scattered along the coast, render but little over a third of the sea-board available for shipping purposes. Nevertheless, as a general feature the country opens out from the mountains into fertile valleys and extensive savannahs. The former nestle, dark and narrow, between beetling precipices down which rush roaring cataracts and raging torrents, brown with the rich soil of the highlands, or spread out beautiful and sunny as an exiled Italian's dream of home, between gently sloping lawn-like tracts of immense extent, the height of which is lost in the gradualness of their ascent. In the eastern part of the island, which flattens out like a great flange, the central mountain chain leads off into another range called "El Gobra," or the "Copper" mountains, in which the peaks attain their greatest height, reaching in some instances to 8,000 ft.

The scenery amid these Cuban mountains, as may be supposed, is exceedingly grand. What principally strikes the tourist fresh from northern climes, is the rank luxuriance with which the vegetation spreads itself in every conceivable direction. Now, it is clinging with a tenacious grasp along the bare, frowning precipices; then, it is curling and wreathing in wild, fantastic tangles around the brows of a rocky maze, from which it

shoots upward, as it were, to the lower branches of detached trees which stand like advanced guards from the ranks of the adjacent forest. The forest! Let us wend our way thither—it is in these forests that cover nearly two thirds of the island, that the luxuriance, the splendour, of tropical vegetation may be seen to best advantage. Into these deep and dark recesses the foot of man but seldom intrudes, and the golden sunshine scarcely penetrates. The whole scene is dank and dark —the foliage is dripping from the morning shower—the fallen leaves and the vines beneath are spongy to the tread, whilst high above all, the great branches twine and interlace like a gigantic rout of serpents. What with all these, and the deep silence that reigns in this grand cathedral of Nature, you feel ineffably oppressed, and begin to long for an unknown something with an unutterable yearning. But nevertheless, the scene is grand, if weird.

Unlike most tropical countries, you may wander for weeks in the wilds of Cuba without coming upon a single venomous reptile. Occasionally, the scales of a harmless snake may glimmer in the sunlight as it glides across your path ; now and then a great spider may dart down the fairy cables that anchor his web in mid air, or a glorious green lizard like a huge carved emerald, startled by your presence, may miss the fly at which it sprang, and drop upon your shoulder; but these are all, if we except the innumerable colonies of ants that infest the forests. Unlike the forests of some other tropical countries too, you are not here startled by some fierce beast of prey as it comes tramping, or bounding, or gliding through the under-

wood to meet you face to face—in a life and death struggle. But amongst the branches above you, flash in the golden sunshine birds that literally blaze with bright colours—orange, crimson, purple, blue, green, darkest black and fairest white, all are blended and varied in their plumage—but not a single note can their throats give forth. Sometimes, however, in the winter months, you may suddenly hear a solitary burst of song, all the richer and fuller for its rarity. This is from the throat of a visitor from Florida's flowery shores. Around you flit the little gorgeous humming birds like living jewels, and great butterflies with their wide spread wings exquisitely variegated.

And now the curtains of the night are drawn close before the windows of heaven, with the rapidity peculiar to the tropics, and darkness is upon us. Above, one by one, the stars begin to stud the purple canopy of heaven, stealthily shooting their soft radiance through the interlacing boughs. Beneath and around, by hundreds, little miniature stars begin to twinkle, and, as the darkness deepens, they rise on fairy wings and sweep about like a whirlwind of light. Night is no longer gloomy—its darkness is superseded by a flood of living, breathing light! One begins to think, involuntarily sinking into a rapt, poetic contemplation, that if, whilst the nights certify each other, the stars in the solitudes of Infinity declare the glory of God to man, how much more to the purpose is that glory declared by these living stars, here, in the midst of Cuba's primæval forests. The practice of the Cuban belles, of pinning these little creatures amid the waving tresses of their black hair and upon the skirts

and borders of their dresses, is cruel beyond description, and cannot be too severely condemned. But if these attractive though humble little creatures declare GOD'S glory as they shine amidst the forest wilds; a moment more, alas! and His glory is scandalised, in the person of His last, best handiwork. The tropic forest is never silent at night, and the wind is moaning through the swaying branches, now striking wild, half-formed strains of music from the taut vines which interlace the upper boughs, and festoon the lower in wild profusion, as from Æolian harps. And now a night-bird hoots hoarsely through the darkness—and another answers—and yet another. But hark—how unnatural, how human are those tones! A bloodhound in the Spanish camp down in the valley yonder thinks so too; listen to his growl, now rising into a full-toned bay. Again the birds repeat their dismal hoots, and now the little ponies of the Spanish mountain-cavalry blend their neighs with the bloodhounds' deep-mouthed chorus. There is danger in the wind, and bustle and confusion take the place of restful peace in the camp. But it is too late. An overwhelming torrent of guerilla warfare sweeps in vengeance over the tyrants' camp, and another detachment of Spain's modern chivalry is sent over to the great majority. Of Cuba may it indeed be said

> "Though every prospect pleases,
> And only man is vile"

Supposing Jamaica to have been the most southern limit of the northern coast of the great inland sea we have presumed, in that island we find a duplicate chain of mountains to the "El Cobra," traversing the greatest length of the land. Also like the "El

Cobra," they attain their utmost height in the east, rising to over 7,000 feet in the peaks known as the Blue Mountains. The whole length of the chain is intersected with valleys, for the most part deep and narrow, which form the beds of many shallow and rapid rivers. There is only one extensive tract of open land in Jamaica at all corresponding with the great Savannahs of Cuba. This is the plain of Liguanea on the south. The island is very well cultivated, but the mountain scenery, especially amongst the peaks, ridges, and valleys of the Blue Mountains, is exceedingly magnificent, and scarcely inferior to that of Cuba in any respect, save extensiveness—in some instances.

The next island that attracts our attention is Hayti. The extreme western points form two peninsulas which extend a considerable distance from the mainland, thus forming the great bay of Gonaives, on a deep harbour of which stands the city of Port-au-Prince, the capital of the Haytian republic. We have already said that the island is divided into two states. These are the scenes of almost incessant warfare, the consequence being that one of the fairest, richest and most favoured countries of the world is converted by the violence of passion, and the unreasoning delirium of ignorance emancipated from all restraint, into an arena of bloodshed and a parade ground for the most abject form of anarchy. Within the last year Port-au-Prince was lively with fire and sword, the President, Solomon, issuing "manifestos" to the effect that he would himself reduce the fair city to ashes, and stand alone on the smouldering ruins. Perhaps he had been reading of Nero! It may be noted here, that whilst jealousy between the two republics prevails, they

never come to blows—probably being too busily occupied with their own internal warfare.

The mountains which rise in the northern peninsula, appear to be a continuation of the "El Cobra" range. They traverse the island throughout its greatest length, entering the sea, on the southeastern shores, in bold, rocky headlands. Still farther north, a smaller and isolated chain extends from Monte Christi to the valley of the Yuna. There is also a small range on the south side of the great central range. The principal chain rises, in the interior, into a vast highland tract, whence shoot off several little ranges of hills which reach down to the coasts in all directions. The central highland tract is called the "El Cibao," and contains some of the highest peaks in the West Indies, some reaching the altitude of 8,600 ft. In this island, as in Cuba, are met with scenes of the wildest grandeur and most dreamy loveliness. How the spirit of SHELLEY, or of MOORE, would here have bathed in light and colour as it never did before; and the fire of BYRON'S descriptive genius would have burst into a flame of unsurpassed brilliance. Besides valleys and plains innumerable, in the centre of the island is an immense plain, called the Cul-de-Sac, which was, about the end of the last century, the centre of flourishing cultivation, but is now a wilderness of forest and jungle. A very inconsiderable portion of this fine island is under cultivation now, the greater part being abandoned to nature, owing to the political anarchy that prevails. The forests are composed of woods of most valuable descriptions, such as mahogany, lignum-vitæ, and cedar. So profuse is the growth of the former, that there is a house

in St. Domingo, not many miles from Porto-Plata, built entirely of that wood, the owner having assured us that he found it less expensive to utilise the raw material at hand than to convey the ordinary building materials from the port. Minerals of all kinds are said to abound in the interior, and under European government were somewhat extensively worked; but the mines are now entirely abandoned. At the eastern extremity of the most northern range of mountains, there is a hill called the "Loadstone Mountain," all the rocks and stones of which possess magnetic properties, some to a considerable extent. From this "mountain" one may descend to the banks of the Yuna, thence to embark in a boat and drift dreamily on to the bay of Samana, through prospects of exquisite beauty and weird grandeur that are constantly changing, and blending with each other, like the scenes in a dissolving view exhibition.

Crossing the Mona Passage, we arrive at Porto-Rico—the "Golden Gate." This is the last, and smallest, of the Greater Antilles. The great mountain chain which we have followed from Cuba through Hayti, takes a southerly incline in the latter island—and appears to reach the coast of Porto-Rico at its south western extremity. Thus, in the latter island it ranges along the southern sea-board. Having traversed the length of the land, however, it turns off, at the eastern side, in a north easterly direction, and falls into the sea, to reappear in bold, broken peaks and rocky ridges amongst the Virgin Islands The interior of the island, north of this range, does not slope gradually to the Atlantic coast, but is composed of broken mountains and chains of hills, varying from one thousand to over three

thousand feet in height. The mountains of Porto-Rico are not very lofty, the highest not rising much above 3,600 feet; but the scenery is pretty in many places, and always very bold, though lacking that indescribable charm which characterises that of the larger islands.

Leaving Porto-Rico, we next arrive at the group of the Virgin Islands, which is composed of a cluster of small islands, islets, rocks and coral reefs. The principal islands are St. Thomas, Tortola, and St. Croix. St. Thomas is scarcely more than a barren, elevated rock of some size. It is almost destitute of any sort of cultivation, and depends entirely on its favourable commercial situation for its importance. There are, nevertheless, some very pretty bits of scenery to be found. Tortola, on the contrary, is of no importance whatever, but is an exceedingly lofty island for its size, and affords some scenery amongst its towering crests and along its rocky shores that may fire the artist's soul. It lies encircled by some score or more of islets and elevated reefs, and it would be difficult for imagination to conjure up a scene of more perfect loveliness than that from the high peaks and ridges of this island at about daybreak. Picture yourself standing there, two thousand feet above the sea, and gazing around, as the dim gray of the morning twilight begins to yield to the light of day. Beneath your feet the bases of the hills seem to rise black and gloomy from the dull, grayish water, which is broken into foam just where the waves lazily curl around the coral reefs that stretch outward from the shore. Far away to the north and east lies Virgin Gorda like a great black snake, and

stretching thence to the south and west, as far as the eye can penetrate the dim veil of the morning, are the islands, rocks and reefs of which we have spoken. Now the day begins to clear, the gloomy sea grows brighter and the dark chain of islands more defined. The chill blast of the morning rushes in from over the great waste of the ocean; the banks of leaden clouds that have been hanging in the east break and rise; higher and higher they lift; a flood of rosy light streams up from the horizon, which, as it catches the trailing skirts of the clouds, is reflected in an amber tinting flood upon the blue gray islands and silver sea. Then, in a great web of woven rays that reaches nearly to the zenith, the sun proudly lifts his unclouded face over the horizon's verge; and suddenly clouds and islands and sea are flooded with the glory of light in all its splendour and power. With many a hoarse, wild scream the seabirds rise from their nests on the rocky shore, and break in rudely upon the solemn silence of the scene. Nevertheless, they are so completely a part of it, that although they have perhaps rudely broken a sweet, soft reverie, you do not resent their untimely intrusion.

St. Croix, which is the richest of the Virgin Islands in natural resources, and second only to St. Thomas in commercial importance, lies some fifty miles to the south of the other islands. It is for the most part flat, and well cultivated. In the centre there is a chain of low hills, rising into a single peak of some height, and falling into the sea on the northern shores in more or less bold headlands. The hills of this island do not appear to have any connection with the great chain; and it is

quite possible that St Croix was always an island, situated near the northern coast of the inland sea we have supposed, as are now Margarita, Curaçoa, Oruba, and others on the southern. It may be well to mention here, incidentally, that although these latter islands, along with the great country of the Guianas, are generally looked upon as forming a part of the West Indies, we do not consider them as such,—at least, in so far as our subject is concerned.

Anguilla is a flat island of coral formation, and St. Martin is little better. In St. Barths, Saba, and St. Eustatius the submerged mountain chain again seems to rise, into what must have been some of the loftiest of its peaks. In the latter island there exists the crater of an extinct volcano that gives evidence of having, not many centuries ago, been the seat of formidable activity. The range next appears in St. Kitts, in beautiful peaks and ridges, which slope down to the sea on all sides, covered, for the most part, with fields of cane. A little over a mile from St. Kitts is the fairy-like island of Nevis, in which the range rises into a single mountain 3,000 feet high. On the topmost ridge of this great mountain, the base of which covers an area of 38 square miles, is situated a crater in which is said to exist a spring that waters the whole island.

The next appearance of the chain is in Montserrat, the conformation of which island answers admirably to the description that Columbus gave of Hispaniola,—a crumpled sheet of paper. The scenery amongst the hills is remarkably fine in some places.

The islands of Antigua and Barbuda appear to be

disconnected with the others, in so far as mountains are concerned. At least, they do not show much elevation, and lie rather outside the line of the island chain.

The double island of Guadaloupe next demands our notice. Although known by the general name of Guadaloupe, it consists of two distinct parts divided by water. These are called respectively Grandeterre and Basseterre. In the latter the mountain chain we are following rises into high volcanic hills, which are intersected by valleys, and deep gloomy ravines down which rush innumerable springs, streams, and torrents. Amongst the hills lies a weird spot which is the seat of an immense geyser that is almost incessantly active. Many smaller geysers also occur, and are the safety valves, so to speak, of the undying fires that ever burn under this island and its neighbour, Dominica. We need not add that the scenery is exceedingly grand. Grandeterre is flat, and of purely coral formation, and was, originally, probably a coral island adjoining the mainland.

The island of Dominica is the most central of the Caribbees, and the principal seat of volcanic action in the West Indies. Here the mountains reach their greatest height after leaving Hayti; Diablotin, the loftiest peak, attaining an altitude of 5,600 feet. The island consists of one mass of mountains piled together in the most wild and fantastic forms. They however follow the centre of the land from north to south, shooting off smaller ridges and peaks which run towards the shores east and west, entering the sea in bold headlands, and rendering shipping in many places impossible, and always dangerous, along the windward coasts. The

whole interior of the island is covered with vast forests of most valuable woods. At almost every step one is met by the evidence of volcanic activity, but there is no volcano, properly so-called. Instead of this, the crust of the earth is literally honeycombed with geysers, the strength and activity of which give a fair idea of what they would be were the power distributed among them focussed into one crater. From what we have said, it may be inferred that the interior is but little known; hence it was only recently that the presence of a *boiling lake* amongst the mountains was discovered. This great natural wonder, nearly a square mile in extent, continued to boil between, and lash against its lava shores, and was the principal point of attraction to tourists in the West Indies, until early in the year 1880, when it suddenly emptied itself. An adjacent forest was completely destroyed, the rivers in the vicinity were choked for weeks after, and Roseau, the capital, many miles distant from the seat of the eruption, was covered with darkness for some time, during which a volcanic shower of thin sulphurous mud fell. The scenery amongst the mountains is both sublime and lovely. Nothing can exceed the bold grandeur with which the peaks rise in mighty terraces one above the other to the very clouds, which ever hang around their rocky crowns; or the gloomy aspect and the tremendous solitude of the apparently bottomless ravines by which they are split, down in the unseen depths of which the bellowing torrents, fed by perpetual mists and frequent rains, ever thunder. But whilst this is the general physical character of the island, it is by no means entirely so. The ravines frequently widen out as they near

the shores, gradually expanding into beautiful and thickly wooded or well-cultivated valleys, through which the great torrents of the mountains gently roll along as shallow rivers. Although mostly shallow, these rivers often form themselves into deep, dark pools, under the steep banks of which swim innumerable fish.

The next island is Martinique. It is wild and mountainous in the interior, and exhibits traces of volcanic action; but its fires, if not quite extinct, are much less active than those of Dominica and Guadaloupe. The mountains descend to the coasts in low hills, and although in some places they enter the sea in bold headlands, they for the most part slope towards it, leaving the seaboard and the adjacent country open and level. The scenery is very pretty, and, from the sea, resembles that of St. Kitts more than that of Dominica.

The island of St. Lucia is a reproduction of Dominica, on a somewhat smaller scale. In actual extent it is fifty square miles less, and in scenic effect it is proportionately so. It is also volcanic, and a crater that exhibits occasional signs of activity lies amongst the mountains. The most beautiful sight that the island affords is two peaks, called the Pitons, which rise abruptly from the sea on the south-western side, and trend upward, with an unbroken conical taper, to the height of 2,700 feet. The effect to one entering the harbour that lies immediately at their bases, is unspeakably fine.

In St. Vincent the great mountain chain rises into a volcanic ridge which traverses the island from north to south. At the northern extremity there is a crater

3,000 feet high, that has been inactive since the year 1812, at which time there was a terrific eruption. The lava poured down the side of the mountain in torrents, whilst vast quantities of rocks and ashes were hurled into the air. The latter were driven to a considerable distance, some falling in Barbados, distant nearly 100 miles to windward. The highest peak of the range rises to 4,800 feet. The scenery in the interior is bold and beautiful, but the land, for the most part, slopes away towards the shores.

Grenada, with its dependencies the Grenadines, and Tobago, are the last of the small island chain. The great mountain chain seems to end in the former to reappear in Trinidad, the hills of Tobago appearing to have been detached peaks, if connected with the chain at all. They are simply formed of a mass of rocks rising abruptly from the sea.

Barbados, one of the principal British colonies in the West Indies, lies away to the east of the other islands, and was, probably, never connected with the supposed mainland. The island is almost flat, and entirely of coral formation. It possesses, nevertheless, very diversified scenery, the picturesqueness of some of which is perfect.

Trinidad is the next, and last island with which we have to do. The mountain chain we have supposed as traversing the tract of land subsequently broken into the West Indian Archipelago, reappears here, and forms itself into three distinct ranges of hills—hence the name Trinidad. From this island they appear to join themselves to the chain which traverses the northern coast of Venezuela, curves south to avoid the lake of Maracaybo,

and running through Columbia in a somewhat south-westerly direction, again joins the great chain that traverses the entire American continent. As may be easily supposed, with her three chains of mountains, Trinidad abounds with scenery of the most picturesque kind. The peaks of the northern range are the loftiest, but even these do not rise to any considerable altitude. The country lying between these hills, and that to the southern part of the island, is, generally speaking, level. All the picturesqueness of the Lesser Antilles seems to culminate in this island, and the scenery of Jamaica itself is, in some instances, rivalled. A long horn extends from the south-western corner of the island towards the American coast, and a shorter from the north-western, the length being made up for by a group of lovely little islands called the Bocas. Thus is enclosed between Venezuela and Trinidad the magnificent sheet of water called the Gulf of Paria. The south-western portion of the island contains a large lake of asphalt, apparently inexhaustible. We are ready to allow the interest which attaches to this lake on account of its unusualness, but we fail to recognize the picturesque beauties that are claimed for it.

As may have been inferred from what has been said, whilst some of the islands are of purely coral formation, the greater part of them are volcanic, although but few of their number manifest any activity at the present time. In the years of the prehistoric era, however, during which we have presumed the occurrence of a natural convulsion which materially changed the geography of Central America, and for a long while after, these islands

must have been an arena for volcanic action such as is not now to be found in any part of the world. It may be and doubtless is a vast conception, but it is also a probable one, to picture to the mental vision a continent, the centre of which was encircled by a fiery zone of mountain peaks which were forever pouring into the surrounding ocean great floods of volcanic matter. In such a manner, what were immediately after the mighty convulsion nothing but the isolated peaks of the submerged chain, would by degrees build themselves into the present islands by the constant deposit of lava, which, though reaching the water in an incandescent state, would instantly solidify on contact with the cold element. In process of time, as the slow centuries rolled into their decades, this mighty furnace, the bare conception of which startles imagination, gradually cooled, its fires begun to be exhausted, and here and there only an isolated volcano remained, which became more and more quiescent, until the present condition of things was reached. Relieved at last from the intolerable presence of the ever-devastating fire-storms, the rich volcanic soil naturally broke forth into exuberant vegetation. Well watered by innumerable springs, streams and rivers, and heated by the life-creating rays of the tropical sun, it did not require the lapse of many centuries to spread that vegetation over the land, from the sand-encircled shores to the loftiest peaks.

As we have shown to be the case in many of the islands, volcanic action has not entirely ceased, and sometimes the inhabitants are sorely exercised by the sudden quivering of the ground beneath their feet. As a general rule, these earthquakes are confined to the quivering ;

but sometimes, fortunately not very frequently, they develop into serious calamities. The principal earthquake on record is that which destroyed the city of Port Royal, Jamaica, in 1692. About the same time Jamestown, the then capital of Nevis, was also destroyed by an earthquake. As we have already said, in 1812, the island of St. Vincent was the scene of an extensive volcanic eruption. Coming down to our own time, in the year 1867, the Virgin Islands were convulsed by a terrific earthquake, or more properly speaking, series of earthquakes, and nearly submerged by a tidal wave. The latest disturbance is that we have already mentioned as having taken place in Dominica in 1880.

In some of the islands is to be found evidence of their being connected with others by submarine channels. Thus, any commotion in the *Souffrière* at St. Vincent produces a corresponding action in that of Grenada. Again, during the earthquake in the Virgin Islands in 1867, the sea was thrown up along the western shores of Dominica, whilst, as far as we can ascertain, nothing of the sort occurred in any of the islands between. But besides these inter-insular connections, we are of opinion that the waters of the Caribbean are in like manner connected with those of the Pacific. About the same time as the tidal wave swept the shores of the Virgin Islands, a remarkable phenomenon was witnessed by the officers of a British man-of-war in the Pacific ocean. This consisted of a solid column of water, which rose to a considerable height and sank again. Being unable to put our hands on the newspaper report, we quote this occurrence from memory, and are therefore unable to give the exact details. The fact, however, is as we state.

Of course, this may have been a mere coincidence, it however attracted our attention, and the suspicion has been lately strengthened. The *St. James's Gazette*, London, of the 1st September, 1883, writes :—

"The Superintendent of the United States Coast Survey reports that unusual waves appeared at San Francisco at one a.m. on Monday, increased later in the day, and were again noticeable on Tuesday. The time between the waves was forty minutes. Similar phenomena were observed after the earthquake of 1854 in Japan and of 1868 in Peru ; hence the present wave is attributable to the occurrence in Java ; "

and the *St. Christopher Gazette*, West Indies, dated the 8th of the same month, has the following strictly parallel paragraph :—

" A strange phenomenon took place at St. Bart's on the afternoon of Monday, the 27th ultimo. The sea receded, and returned to a long distance on the land, which naturally created some alarm. Many of the buildings are close to the sea shore, so the excitement may easily be imagined. There were no shocks of earthquake as was at first supposed."

The theory to which these incidents have given rise may be of no practical utility, but it is not so devoid of interest in itself as to prevent our placing it before our readers.

On this subject of the mountains of the West Indies considerably more might be said ; but, unfortunately, the space at our disposal does not warrant our entering into it at greater length than we have. On a future occasion we may devote a few pages to descriptive sketches of those lovely islands, but for the present the arbitrary requirements of a magazine article necessitate our closing the present sketch ; and here, therefore, we will bid adieu to

> Those leafy islets on the ocean thrown
> Like studs of emerald on a silver zone.

Our Representation at the International Colonial Exhibition of 1886.

By Geo. H. Hawtayne.

I beg to offer the following suggestions as to the best mode of effecting a thorough representation of British Guiana at the Colonial Exhibition to be held in London in 1886.

The local Exhibition under the charge of the Royal Agricultural and Commercial Society, which would otherwise have been held this year, having been postponed until 1885, may conveniently be made the means of collecting exhibits from which the best specimens may be selected for the Internationial Exhibition of the following year.

Our former Exhibitions have too frequently suffered from the indifference shown by persons who are able, and who might be induced, to contribute, and from delay in collecting or forwarding exhibits, followed by hasty preparation and undue pressure on the time and resources of those entrusted with receiving and arranging the various contributions. The first of these evils is possibly due to hesitation arising from the want of knowing what to exhibit and how to exhibit; and the latter may arise from there being no one to assist or encourage intending exhibitors with advice and to keep them up to the work.

It is true that 1886 is a long way off, but it is equally true that to collect, manufacture, or prepare good specimens properly will take all the intervening time, with much constant care and industry. No time therefore

should be lost in endeavouring to arouse, and (what is more important) to keep alive, a general feeling of interest in the matter and to secure the assistance and co-operation of all who can contribute or otherwise help.

I would suggest then, that there should be a general Committee, consisting wholly or in part of members of the Society under the auspices of which the Local Exhibition of 1885 will be held, and that the Colony be divided into districts, in each of which there should be a sub-Committee, formed of persons who would be able and willing workers—and by persons I mean women as well as men. To ensure success we should need all the help which feminine taste, tact, and industry can give us.

The corresponding Secretary of the Society in London, Mr. WM. WALKER, and the Secretaries of the Royal Colonial Institute have assured me that they will gladly assist in every way in their power. The appointment of Mr. FREDERICK YOUNG as a member of the Committee of the Exhibition to be held at South Kensington this year is evidence of a wish to enlist the sympathies of the colonies, as represented by the Institute.

Our sub-Committees should meet at regular, but not too frequent, intervals; and the work done towards furthering the Exhibition at each meeting should be recorded.

The General Committee should, at as early a date as possible, draw up a list of the exhibits they desire to obtain; and a copy of this list should be sent to each sub-Committee, whose duty it would be to decide (or if need be to add) what could be contributed from its district, to ascertain the persons from whom the best exhibits could

be obtained, and to interest such persons and afford them all necessary information and assistance.

I think we should, in this way, be more likely to enlist the co-operation of those who, as a rule, do not exhibit, and to remove many difficulties which tend to discourage an intending exhibitor.

Prizes, of course, will be offered for the best specimens &c., at the Local Exhibition in 1885, and it should be stipulated that any exhibits may be retained and sent by the Committee to the London Exhibition of 1886. At the option of the exhibitor, such selected articles might either be bought by the Exhibition Committee—in which case they would of course be exhibited in the name of the said Committee, or they might only be lent to the Committee—in which latter case it would only be just that such articles should bear the name of the owner.

The General Committee should, as soon as practicable, form an estimate of what bottles, jars, or boxes, cases, &c., will be required for the efficient and attractive exhibition of specimens; so that a supply may be provided in the colony or from Europe. And, as it will not be possible to form such an estimate before it becomes, in some degree, evident what number of exhibits can be got together, the Exhibition Committee should *at once* order from England a considerable supply of bottles and glass vessels, both for food-products, and for natural history specimens. Of these some may be sold, at cost price, to those undertaking to exhibit in their own names; others should be used by the Exhibition Committee for the specimens which they themselves intend to exhibit. Much stress was laid by Mr. KIRKE on the poor appearance at the Calcutta Exhibition of some British Guiana

products, on account of the indifferent manner in which they were put up.

A list of what might, and what ought to be exhibited would be too long for these pages, since there is scarcely any educated and intelligent person who could not contribute something of interest or value. Planters will of course exhibit samples of the produce which has made the colony what it is, and these results of their energy and enterprize will, we may be sure, form a grand feature. There are many besides whose skill may be exercised in gathering together others of the gifts with which nature has so bountifully endowed our land, and the products derived therefrom. It is only necessary to mention some, such as oils, dyes, fibres, drugs, articles of food, &c., which might, without much trouble or expense, be obtained; the reader will readily supply others.

Some of the most interesting and attractive objects at the Fisheries Exhibition, last year, were the models. Every thing connected with fish-breeding, fish-catching, fish-curing and packing, which was too large to be shewn in its natural size was represented in miniature; and so might we exhibit models of plantations, showing their arrangements of cultivation and buildings and their system of drainage and canals: models of our dwellings, or even one of our Georgetown streets reproduced *in petto*: of the boats and other craft that are peculiar to our rivers and coast, and of several other objects. It is proverbial how little people at home know of our colony and of the daily life and occupations of its inhabitants; models such as these would teach more readily and more accurately than any number of written pages, and

they might be made by any who possess ingenuity and leisure.

Some years ago it was suggested to the Royal Agricultural Society that some attempt should be made to secure and preserve in the Society's Museum objects of interest to be found in British Guiana which for want of care are, year by year, becoming lost.

Scattered through the colony are many articles which, although no longer new to us, would be most interesting to strangers. Can no one rout out of some odd corner an old sugar mill, which would afford a striking contrast to the splendid specimens of modern engineering skill that we may be sure the leading manufacturers of machinery will exhibit in 1886? Are there no relics of the old cotton and coffee industries which, with others, are lying it is hoped only dormant, for want of labour and a remunerative market? There must be here and there specimens of old china and glassware, quaint ornaments, old fashioned plate, coins, weapons, tools and other odds and ends of the past, illustrative of the habits and customs of the earlier colonists. Surely with a little trouble and perseverance many such objects of interest would be discovered.

Trophies, as they are called, are very often an excellent mode of exhibiting articles which, in detail, are commonplace and uninteresting. I do not say that a pyramid of sugar hogsheads would be a thing of beauty, but, as nets gracefully festooned, and even kegs and preserved food tins, more or less artistically arranged, have been made to present an attractive appearance, so might British Guiana show similar, and by no means ugly, arrange-

ments of its products. Hammocks, shingles, walking-sticks, pottery, weapons, Indian feather-work, models of fruits and vegetables, occur to one as being thus capable of effective grouping.

The Natural History contributions should be most varied, and ought to be deeply interesting. Our colony can afford a valuable collection of skins and of stuffed "birds, beasts and fishes." Plaster of Paris casts of fishes are not difficult to be made; and some of our young friends in want of an interesting in-door occupation might profitably turn their attention to the preparation of these and other exhibits. There should be large and well arranged collections of insects, of the eggs and nests of birds, of insect homes, and of specimens showing the depredations of insects on various substances. The shells, marine, fresh-water and land have, I believe, never been collected, except scantily by the SCHOMBURGKS; and the above and many other similar objects are recommended as being by no means difficult to gather or prepare. There are obstacles in the way of sending home live animals, but a tolerable measure of success in transmitting living specimens to the Zoological Society in London, encourages me to suggest that, with proper cages, a little attention on the voyage, and a favourable season, a great many might reach the Exhibition in health and safety.

The ethnographic exhibits also should be large in number and variety. Those whose avocations bring them into contact with the aborigines would be able to collect specimens of their weapons, basket-work, earthenware, fishing implements, ornaments, &c., &c.; and it may not be too much to suggest that a party of native

Indians, with their huts and in their daily habit as they live, would prove a great attraction. There were Chinese at the "Fisheries" who were much examined and admired, and crowds were attracted by the comely faces and quaint dresses of the fisherwomen from various countries. So, I am sure, that a bevy of our aboriginal damsels dispensing pepper-pot or paiwarri would outshine all others and eclipse the most fascinating ladies of the refreshment contractor's staff.

In conclusion, I would appeal to all interested in this most interesting colony as their birth-place or their home, or the source from which they derive their means, to use every effort to cause British Guiana to be so represented at the Colonial Exhibition in 1886 as to show the world that, among the many colonies of which Great Britain's Empire is composed, our colony has not been unduly termed the Magnificent Province.

Wet Megass, Sun Dried, and Logie Megass, as Fuel.

By Nevile Lubbock.

WITH an extraction of 66· per cent. of juice, 34 parts of megass will remain, out of 100 of canes. These 34 parts will be composed nearly as follows:—

12·5	parts wood	=	37 per cent.
17·5	„ water	=	52 „
4·	„ sugar	=	11 „
34			100

The same megass, if dried in the sun, will lose most of its water, and will contain, if well dried

12·5	parts wood	=	62·5 per cent.
3·5	„ water	=	17·5 „
4	„ sugar	=	20 „
20			100

but the weight will be reduced, from 34 to 20, or to 58·8 per cent. of the original weight.

When megass is logie-dried the sugar by decomposition becomes lost, and the megass will be composed nearly as follows:—

12·5	parts wood	=	about 84 per cent.
2·5	parts water	=	„ 16 „
15			100

The weight at the same time being reduced from 33·3 to $11\frac{1}{2}$, or to 34·5 per cent. of the original weight.

The value of these different conditions of megass as

fuel, depends upon the wood, and the sugar, diminished by the water contained.

The following data, taken from Box's "Treatise on Heat," enable us to calculate the relative values roughly.

A unit of heat means such an amount of heat as is required to raise the temperature of 1 lb. water, at 32° Fahrenheit, 1° Fahrenheit. The amount of heat required to raise the temperature of 1 lb. water 1° Fahrenheit increases slightly as the temperature increases, so that 180·9 units of heat are required to raise 1 lb. of water from 32° Fahrenheit to 212°. The amount of increase is so small that it has been neglected in the following calculations:—

The specific heat of vapour of water with pressure constant is ·475.

The latent heat of vapourization is 966°.

The heat evolved by the combustion of 1℔ carbon is 12906 units.

1 ℔ wood perfectly dry contains ·51 ℔ carbon.

The value of sugar as fuel arises solely from the carbon it contains; the hydrogen being combined with a sufficient quantity of oxygen to form water, giving no useful heat.

The chemical composition of cane sugar being $12_C\ 22_H\ 11_O$, it contains 42·1 per cent. of carbon.

The weight of air required for combustion, taking twice the theoretical weight, is—

For	wood (dry)..........12·25	lbs. per lb.	wood.
,,	coal......................22·4	,,	coal.
,,	carbon..................24	,,	carbon.

The temperature of the water contained in the fuel and the air required for combustion is assumed at 86° Fahr.

The temperature of the gases passing up the chimney is assumed at 600° Fahrenheit. The specific heat of air is ·238 with pressure constant.

WET MEGASS.

Composition............	37	parts	wood.
	52	,,	water.
	11	,,	sugar.
	100 lbs.		

	Units of Heat.	
Wood—		
$37 \times {}^{\cdot}51 \times 12906$		$= 243536$
Sugar—		
$11 \times \frac{42{\cdot}1}{100} \times 12906$		$= 59754$
Less Water to Steam—		303290
$52 \times (212 - 86 + 966)$	$= 56784$	
Steam—		
$52 \times (600 - 212) \times {}^{\cdot}475$	$= 9583$	
Air for Wood—		
$37 \times 12{\cdot}25 \times (600 - 86) \times {}^{\cdot}238$	$= 55296$	
For Sugar—		
$11 \times \frac{42{\cdot}1}{100} = 4{\cdot}63$ carbon.		
$4{\cdot}63 \times 24 \times (600 - 86) \times {}^{\cdot}238$	$= 13569$	
		135232
Units available..................		168058

SUN DRIED MEGASS.

Composition..............	62·5	parts	wood
	17·5	,,	water
	20·	,,	sugar
	100 lbs.		

	Units of Heat.	
Wood—		
$62{\cdot}5 \times {}^{\cdot}51 \times 12906$		$= 411378$
Sugar—		
$20 \times \frac{42{\cdot}1}{100} \times 12906$		108668
Less Water to Steam—		520046
$17{\cdot}5 \times \left\{(212 - 86) + 966\right\}$	$= 19110$	
Steam—		
$17{\cdot}5 \times (600 - 212) \times {}^{\cdot}475$	$= 3225$	

Air for Wood—

$62{\cdot}5 \times 12{\cdot}25 \times (600 - 86) \times {\cdot}238 = 93650$

For Sugar—

$20 \times \frac{42{\cdot}1}{100} = 8{\cdot}42$ carbon.

$8{\cdot}42 \times 24 \times (600 - 86) \times {\cdot}238 = 24720$

140705

Units available.................379341

LOGIE MEGASS.

Composition............84 parts wood
16 „ water

100 lbs.

	Units of Heat.
Wood—	
$84 \times {\cdot}51 \times 12906$	=552893

Less

Water to Steam—

$16 \times \{(212 - 86) + 966\} = 17472$

Steam—

$16 \times (600 - 212) \times {\cdot}475 = 2948$

Air—

$84 \times 12{\cdot}25 \times (600 - 86) \times {\cdot}238 = 125879$

146299

Units available....................406594

Thus we find that the units of heat available from the combustion of 100 lbs. of megass, in the three conditions, are as follows :—

Wet megass, direct from the mill......... 168058 units.
Sun dried megass.................................. 379341 „
Logie megass... 406594 „

but, as we have seen, 100 lbs. of megass, wet, direct from the mill, when sun dried is reduced in weight to 46·5 lbs., and when dried direct in the logie to 33 lbs.;

reducing the above figures to these proportions, we have—

For 100 lbs. wet megass..................168058 units.
Sun dried megass $\frac{58 \cdot 8}{100}$ of 379341 = 223052 „
Logie megass $\frac{44}{100}$ of 406594 = 178901 „

Comparing now these results with Scotch coal, and taking our data again from Box's "Treatise on Heat," we find—

100 lbs. Scotch coal gives ....1300600 units.

Less for air required—

$100 \times 22 \cdot 4 \times (600 - 86) \times \cdot 238 = 274022$ „

Units available 1026578

From these data it appears that it requires—

611 lbs. wet megass.
270·6 lbs. sun dried megass.
254 lbs. logie megass.

to give the same amount of available heat as 100 lbs. of Scotch coal, and that, taking the available heat from coal as 100, that from an equal weight of wet megass will be..16.3
From the same weight of wet megass, as dried in the sun..21·7
Ditto ditto logie dried...17·4

If we assume that 8½ per cent. of sugar is obtained from the sugar cane, 12 tons of cane are required to make 1 ton of sugar; and assuming the extraction at 66 per cent., as before, we have

$\frac{34}{100}$ of 12 tons in megass, or 4·08 tons of megass per ton of sugar, say 4 tons.

These 4 tons of wet megass will represent in Scotch coal $4 \times \frac{16.3}{100}$ or ·652 ton of Coal.

Assuming the coal to be worth 28s. per ton, this wet megass, will be worth 18s. 3d.

The same weight of wet megass, if sun dried, would be worth

$4 \times \frac{21.7}{100} \times 28s. = .86 \times 28s. = 24s.$

And if logie dried—

$4 \times \frac{17.4}{100} \times 28s. = .69 \times 28s. =$ 19s. 4½d.

Notes on West Indian Stone Implements; and other Indian Relics (Illustrated).

By the Editor.

Nos. 3 & 4.

[NOTE: It will be observed that in this instalment of this series, the title has been enlarged, to include other relics of the Indians, in addition to their stone implements. Written as these notes are, in a place where is rapidly accumulating a very considerable collection of Indian relics of stone, shell, bone, and of clay (pottery), I find it impossible to confine myself strictly and solely to those which happen to be of stone; more especially as very often—and on the most interesting occasions—the relics of various materials are found associated together in such a way that the one kind throws light upon the other. In future, therefore, relics of all materials and kinds, to be attributed to the Redmen of the West Indies or Guiana, will be treated in these notes. In the one of the two notes will chiefly be discussed the very fine series of stone implements belonging to Sir THOMAS GRAHAM BRIGGS, Bart., of Barbados, who, with truly admirable generosity, has not only placed his fine collection in my hands for description, but has also provided for the due illustration of this description; and in the second will be described a very interesting series of Carib pottery, recently discovered at Pln. *Enmore,* on the West Coast of Demerara.

Furthermore, in this prefatory note it is as well to call attention to a mistake in the last of the papers of this series, by which the "banner stone" described on pp. 255–8, and figured on Plate 5 (Timehri, Vol. ii.) is said to have been derived from St. Lucia and to belong to the collection of M. ROUSELLET, instead, as it should have been, from St. Vincent and to the collection of Mr. E. L. ATKINSON.]

3. SIR THOMAS GRAHAM BRIGGS owns, as many of our readers will know, a large amount of land in more than one of the West Indian Islands, and is the happy possessor of influential

friends probably in most of the islands. Partly from his own lands, partly through the gifts of many friends, he has collected a very large and fine set of West Indian implements of stone and shell; but many of his specimens are, at the present moment, packed away and deposited in various more or less inaccessible ways. Fifty-four of his finest examples he, however, has most kindly brought together and sent me. These now lie on the table at which I am writing. Thirty-three of the examples are of stone, twenty-one of shell.

The stone implements are from the islands of St. Vincent, St. Kitts, Nevis, St. Lucia, and Antigua; and include twenty variously formed implements which, for want of a better general term, may be called 'celts'; ten variously shaped pounders, or rather mullers, generally supposed to have been used for grinding, or rubbing down corn (maize); one mortar with a corresponding pestle; and one pebble of which it seems doubtful if it ever was used by human beings. It is a remarkable fact that in so large a collection brought together in Barbados not one implement of stone should have been derived actually from that island.* On the other hand, sixteen of the shell implements are from Barbados, while the other five are from Nevis, while none of the other islands contribute any implements of this material to the collection.

* The Rev. GREVILLE CHESTER, quoted by STEVENS in "Flint Chips" (pp. 235-6) writes "In Barbados there is no hard stone, nothing harder than coralline lime stone; the aborigines therefore were obliged to import *hard* stone implements and weapons from the other islands, or from the main continent of South America. . . . I have several well-made implements, of hard green and black stone, found in Barbados. . . also a small and beautifully formed implement in the shape of a knife, made of yellowish alabaster."

The stone series, in common with others of a similar kind, has one, and, as far as I know, only one drawback. It consists, as far as can be ascertained, of implements found singly, or at any rate in very small numbers; nor do the exact localities and conditions under which these were found seem to have been recorded. The scientific value of such singly found, unhistoried implements, most of them 'surface-implements' *i.e.* found scattered singly on, or just under, the soil, is of course far less than that of implements from some *find*, i.e. from some one spot, be it site of old dwelling-place, battle-field, or of implement manufacture, where large numbers of implements occur together. In the latter case light is thrown on each implement of the find by all the others found with it; but in the former case the history and use of each implement has to be read, if read it can be, merely from itself—it is, as it were, a single sentence to be construed without sight of the context. Yet the value of surface implements is of course considerable; and this is especially the case when, as in the collection now under consideration, they belong to the highly elaborated so-called Carib class, of which it is unlikely that any large 'find' will ever be made. For, though there can, I think, be no doubt that the makers, whoever they were, of these 'Carib' implements had carried the art of working stone to an unusual degree, and that they naturally used this unusual skill of theirs in making all their implements, yet it is almost impossible that they can have made any very large number of the more elaborate, more ornamented, implements which are especially typical of Carib workmanship; and it is most unlikely that any one man of them, any one

family, or even any house-community of them, possessed any very large number of these implements. So that it is, on the whole, improbable that any large "find" of the Carib implements has ever been, or will ever be made. The value then of the present collection lies, not in showing a more or less complete set of the implements probably in use at some particular time by a certain set of people [though it is probable that all the men were Caribs], but in that it contains a large number of single examples of very finely wrought forms.

It has been said that the 'celts' are twenty in number. But this general term 'celts,' applied, I think exclusively, to wedge-shaped implements, includes a number of slightly various forms which it is somewhat difficult, and yet desirable, to distinguish in words. * Axe, hatchet, chisel, gouge, adze, wedge, and even hoe, are among the many names, most of them pointing to distinct uses, which are too often vaguely chosen and bestowed on one and another of these implements. It is a pity that the word axe has ever been used in connection with stone implements; for it has created a troublesome amount of misconception in the lay mind, and to the student it is obvious that an axe of stone is practically impossible. It would be very desirable therefore to ob-

* Mr. E. T. STEVENS, in his "Flint Chips" (p. 237) notes that he has there (used the term "hatchet" for all stone implements of a simple wedge-like form. Many, doubtless were used in the hand; others were mounted as hatchets, but, probably, more frequently as adzes. The term *axe* has been applied exclusively to grooved or drilled stone implements; these were mounted at right angles to the handle.) To me it seems that the word 'hatchet' is as objectionable, and for exactly the same reasons, as is axe. Moreover, no grooved, still less any drilled, stone implement, can have been used as an axe.

tain as clear an idea as may be of the various natures and uses of the so-called stone-axes; and, that done, to drop the misleading term. As some contribution toward this desirable end the following remarks are offered.

On showing most ordinary men a so-called stone-axe, the idea suggested to their minds is generally of the felling of trees; and with this idea in their heads they either openly or secretly disbelieve, rightly enough, that the stone is an axe. For it seems impossible to fell a tree with that stone. It is, however, quite possible. There are probably several ways of bringing down a tree with no other implements but those of stone; but probably that most usually followed is, or was, as follows. A circle of fire having been made round the stem of the selected tree, this eventually kills the tree and leaves a charred circle round its roots. This charred part is then easily enough, if tediously, picked away with a stone implement; and the tree falls. The trunk once down, the branches can be removed by a similar process. And, say the tree is to be turned into a boat, a line of fire is made along the upper surface of the trunk, as it lies on the ground; which fire gradually smoulders into the wood. Then, again with the stone implements, this charred wood is picked out; and a hollow tree trunk, boat-shaped, is the result. Even to this day, the Indians of Guiana, provided as they are with metal axes and adzes of European manufacture, char and pick out a hollow in a tree-trunk which is to be turned into a boat; they no longer, however, fell the tree by the charring and picking process.

In this primitive method of felling, the implements

used would be, not axes, but picks, attached to handles and used as adzes, and perhaps also wedges, used as our modern cold chisels. No other tool is absolutely necessary; and both these can be made of stone. They are, moreover, absolutely simple tools; for a properly selected natural stone attached to a handle, may be used, without further fashioning, as the pick or adze, and it is yet easier to find a natural stone, to be used without even a handle, to serve as a wedge. When the art of working in stone was perfected, the natural pick-stone being shaped and polished, would become in all essentials an adze, the wedge a cold chisel. And when the use of metal was adopted, by a mere change of material, not essentially of form, the adze and cold chisel as we know them were produced.

Where, as among many American tribes, the use of metal was not a natural development but was introduced by the early European explorers, there is of course a break in this history of the evolution of the adze and cold chisel.

It may not be out of place to enquire next, whence and when arose the real axe. This is obviously a development, not of the picking instrument or adze, but of the splitting instrument or wedge. Indeed the chief essential difference between an axe and a wedge is merely this; whereas the wedge has to be inserted in its cleft by the fingers, and, after it has been driven in, to the required depth, and forward by straight blows delivered with a mallet or some object used as a mallet, is then beaten to one side or the other by some additional heavy implement—a mere heavy stick will suffice, in the axe these two implements are combined, the wedge

or, as it then becomes, the blade being inserted in or attached to, the stick as a handle, which handle now allows the blade to be driven sufficiently far into its cleft with new force; and, the blade once inserted, the power which forces it to one side or the other, to cause the required split, is applied through the lever-handle. But, with an exception presently to be mentioned, the blade can hardly have been fastened to the stick, the wedge and stick can hardly have developed into the axe, while stone was the sole material used. For an unhandled blade of stone can hardly have been sufficiently sharp to enter deeply enough into the cleft, nor could it have been sufficiently tough to endure, without breaking, either the jar caused by such entry into the cleft as it could make or the side strain the application of which would be necessary to effect splitting. The axe then, as a cutting tool, seems to have been a development of the wedge, but only to have become possible when the wedge was made no longer of stone, but of metal. A stone axe, then, in the sense of a cutting tool, is an impossibility.

But it must be noticed that an implement of stone which is in a limited sense an axe not only could be made but, as can easily be shown, very frequently was made, and is still made by stone-age folk. But these 'axes' are, not cutting *tools*, but *weapons*, intended to enter with force into such comparatively soft substances as the bodies of the human or other enemies of the wielders. Such a 'battle-axe' of stone may be an effective weapon.

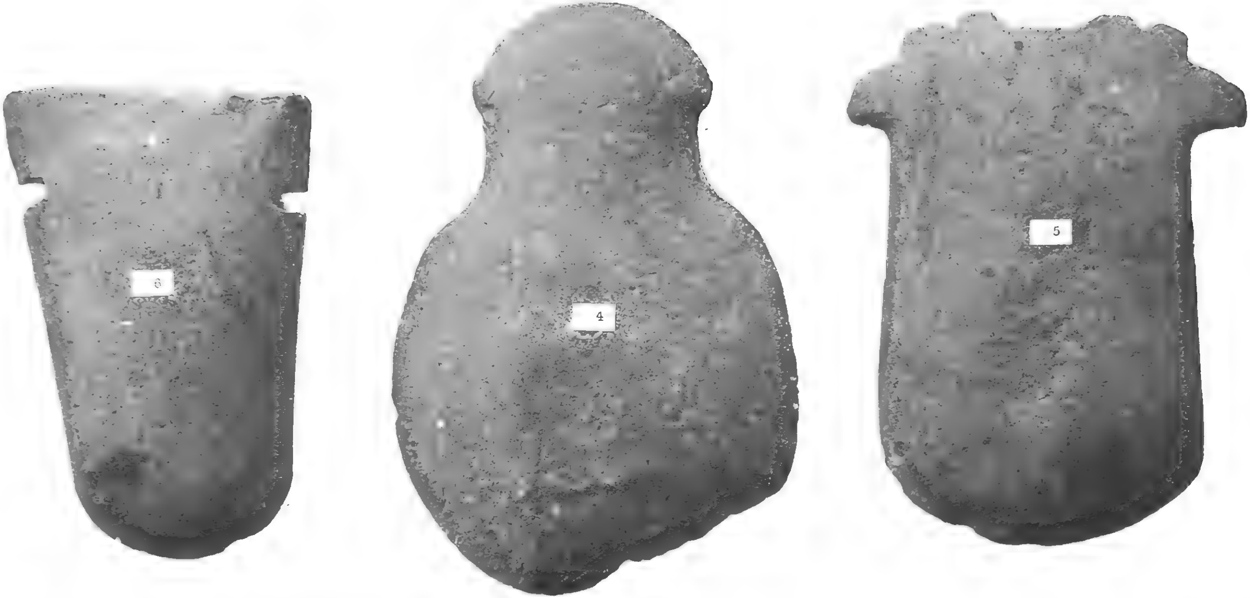
It may also be noticed that the parentage—if one may so call it—of the battle-axe is probably quite different from that of the true axe. A battle-axe was probably

produced, not from the wedge, nor by a mere turning of the ordinary tool-axe to a new purpose, but by a gradual sharpening of the rounded pebble which the more primitive man fastened, to give weight, to the stick which he used much as a modern ' life preserver.'

Accordingly we may reasonably expect to find among the mis-called "stone axes," a term which will henceforth be dropped in these notes, perhaps several kinds of tools, certainly two, viz. wedges (among which may be classed chisels) and picks or adzes; and among weapons we may expect to find battle axes.

But now that we have put away axes, a difficulty still remains. It is probably impossible always to distinguish with certainty between picks (or adzes) and wedges; for in some cases absolutely the only difference between the two may have been that the one was used with a handle the other without. Sometimes it is easy enough to say to which of the two classes a stone belongs. Stones the sides of which are grooved or nicked, are obviously picks (adzes) and not wedges; for while, on the one hand, the nicks or grooves are evidently meant and well adapted to facilitate attachment of the stone to a handle, that is to make it into a pick, on the other hand, these same nicks or grooves, were the stone meant to be used as a wedge, meant that is to receive heavy blows applied to or near one of its ends, would not only be useless but would even greatly weaken the tool. Similarly, as regards the ornamented Carib tools, in which the end opposite the blade, is often elaborately, sometimes very elaborately, carved, it is obvious that there could have been no intention of inflicting heavy blows on these heads. Of

PLATE 8



these, therefore, those that were not, as many doubtless were, intended to be merely kept as ornaments, must have been made as adze blades, not as wedges. Again, the very sharp pointed upper ends of the implements of the petaloid shape, which I have elsewhere spoken of (see Timehri, Vol 1. p. 266 as a specially Jamaican type, and of which a very fine example is here figured from Sir THOMAS GRAHAM BRIGGS' collection, (Pl. IX, No. 7) are obviously not meant to be struck; these too, therefore, must have been attached to handles and used as adzes. On the other hand, the only implements, apparently, of which one can say with certainty that they were made and used as wedges, are certain, fairly numerous,* examples in which the upper end has been brought to a flat surface, evidently to receive blows.

Lastly as regards these distinctions between adzes, wedges, and battle-axes, it is hardly necessary to point out that though each was probably made for some definite purpose, yet the primitive, just as, but even more than, the modern man, probably often turned an implement intended for one, at least temporarily, to some other purpose.

Six of Sir THOMAS GRAHAM BRIGGS' adzes are of the more elaborate 'Carib' type; and these are all figured here (Plates 7 & 8.) The illustrations will show their nature better than could words. Nos. 1, 2, 3 and 5 are all from St. Vincent, and were procured for their present owner by Mr. E. B. GRIFFITH, Treasurer of that island.

* These undoubted wedges I find to be fairly numerous in my Guiana collection; but I am surprised to find that I have at present only one (a very fine one) from the West Indies (St. Lucia).

I have reason to believe that these were originally collected from the villagers of that island, who had doubtless found them as 'surface implements'. No. 5 is especially worthy of notice, because of its peculiarly elaborate 'shoulders.' The fourth, which is a fair specimen of the characteristic West Indian two intersecting circles type (cf : fig. 5, 6, 7. Pl. 6 in these notes,) was procured from Antigua by Dr. DENNELY. The sixth, which is only distinguished from a simple wedge-shaped form by its side-nicks, was procured from St. Kitts by Captain ROGER. Its remarkable asymmetry, which is almost exactly reproduced in other examples I have met with, is worthy of notice, as being probably intentional.

The remaining fourteen adzes are all of the form which may be described as *petaloid,* or petal-shaped. In this form, the commonest of all, the cutting edge is on one, semicircular, end; and from the extremities of this end, the sides slope more or less gradually to meet each other in a more or less sharp point. No. 7 (Plate 9), procured from Antigua by Dr. DENNELY, is the finest specimen I have ever seen of this very highly polished variety of petaloid adze. No. 8, from St. Kitts, is a similar example, but with a thicker cross-section. Nos. 9 and 10, both collected in St. Lucia by Dr. DENNELY, are chiefly remarkable for their material, which is a beautifully mottled gray-green stone. In No. 11, also procured from St. Lucia by Dr. DENNELY, one of the side surfaces is flat, while the other is of the usual convex form. No. 12, from the same island and the some collector, is a pretty little stone, so small that it is somewhat difficult to imagine its use as a tool; it is also peculiar in being broader in its short axis, than any

other adze-like implement known to me. The remaining petaloid adzes (unfigured here) are of the ordinary forms; two were collected in St. Kitts by Captain ROGER, two in St. Lucia by Dr. DENNELY; three in Nevis, one by Mr. E. CONNELL, one by Miss J. HUGGINS, and one by an unrecorded collector.

Figure 13 represents the single example in this collection of a wedge-shaped implement of the so-called Scandinavian type, *i.e.* with more or less flat and parallel, in place of the more usual convex, sides. I have already* given my reasons for supposing that these implements of Scandinavian type, were, in the West Indies at least, used, probably exclusively as the blades of battle-axes. This example, which is from St. Vincent, is the single representative in the collection now under review of such a stone battle-axe.

Leaving the wedge-shaped implements we now turn to the 'pounders', or pestles, and the mullers. It is hardly necessary to point out that there is a difference between the 'pounder' or pestle, used for crushing hard substances by heavy blows, and the muller, used for rubbing down more or less hard substances, as, *e.g.*, a painter rubs or grinds his colours. Practically the muller may be distinguished from the pestle in that its base is an almost perfectly level and smooth surface—worn smooth by much rubbing. The two forms of implements are however used to produce, by slightly different means, similar results. Both forms occur in surprising numbers, not only in the collection now under notice but also in other collections from the West Indies—in the Blackmore and Christy Museums for instance.

* "Among the Indians of British Guiana," London, 1883, p. 425

Perhaps basing my ideas too much on the state of affairs which now prevails, and seems once to have obtained exclusively, in Guiana and generally on the Spanish main, where the universal foodstuff is cassava, which is prepared, not by pounding, or rubbing but by grating and squeezing, I was at one time doubtful whether corn (maize) had been in common use in the Antilles previous to the discovery of these islands by Europeans. The number of pounders and mullers, presumed to have been used for crushing maize, which occur, together with the corresponding fact that almost exactly similar implements are yet in great and almost universal use in Mexico and Central America for crushing corn, certainly seemed strong evidence against my view. It is not however, conclusive. Other food substances than maize—not to speak of other matters, such as paints and dyes—may have been crushed with these pounders. For instance, to this day some few of the better class of True Caribs in Guiana pound their cassava before baking it, thereby greatly improving the quality of their bread. But if maize was not the universal bread-stuff in the West Indian islands then cassava pretty surely was; and these islands (from which, rather than from Guiana, most of these pounders come) were almost certainly the head-quarters of the Carib tribes, a few of whom, comparatively shortly before the arrival of Europeans, found their way into Guiana. It is just possible that the West Indian Caribs used these pounders for crushing cassava, not maize. But, on the whole it is a far more probable assumption—I am here not prepared to assert it as in any way a certainty—that the West Indian Caribs, whose civilization seems to have been above that of the cassava-eaters,

PLATE 10

were, like the Mexicans and the more civilized of the tribes of the North, whom, as I hope to point out some future time, they resemble in other respects also, were maize-eaters and did really often use these mullers to crush corn ; and that when they afterwards went into Guiana they carried with them the habit and tradition of their mullers, and used them to some extent to crush the cassava which, rather than corn, they found was there the breadstuff, while at the same time they, as a rule, adopted the method of preparing the cassava root by grating and squeezing which they found commonly practised on the mainland.*

But, whether used for crushing maize or other substances, it is certain that mullers are comparatively common on the West Indian Islands. The GRAHAM BRIGGS collection includes eleven very fine examples, of considerable variety of form.

Just as with the wedge-shaped implements, so with these pounders, it is difficult to say which of them were probably used simply grasped in the hand, as a pestle, and which of them were bound, or otherwise attached, to handles and used as 'maul sticks,' *i.e.*, heavy hammers or mallets. For instance, a glance at the one here represented as fig. 14, Plate X will show that toward its upper end it is encircled by a deep groove such as, if it occurred in a celt, we should say was meant to allow of the hafting of this implement. But in this case the groove is so deep and broad that it might very well be intended, not to facilitate any form of

* I have elsewhere ("Among the Ind. of G." p. 287) pointed out that, an analogous way, it was probably the Caribs from the W. I. who introduced the use of cotton and the method of preparing this by spinning among the native tribes of Guiana, these latter having before used only palm-fibres, which they prepared by twisting them on their thighs.

hafting, but to afford a good and firm grasp to the hand of any one using the stone as a pestle. This specimen is one of Dr. DENNELY'S acquisitions, from Antigua. It is the only grooved muller in the collection.

The simplest of the remaining mullers (Fig. 15 Plate X), is a natural oval pebble which has been apparently artificially wrought to an obtuse point at one end, and has certainly been ground down at the other end to a very smooth flat surface. This specimen was given to Sir GRAHAM BRIGGS by Miss J. HUGGINS. Fig. 16 represents a very similar implement, but of rather more artificial form, in that the two side surfaces have been somewhat flattened. Both these stones are from the island of Nevis.

From Nevis too came Nos. 17 and 18, (collected by Mr. E. CONNELL) and the much more elaborate No. 19, which was procured on Tower Hill (in that island), by the same collector.

Figure 20 (Plate XI) represents a magnificent specimen. No. 21 closely resembles No. 20 in general character, but is smaller and less well finished. Both these are from St. Kitts, the former procured by Mr. KIRTON. No. 22 is a somewhat similar stone to the last, though better finished. Unfortunately its label has dropped off and its origin is uncertain; but it, too, probably, was found in St. Kitts. No. 23 (Plate XII), procured by Mr. KIRTON in St. Kitts, is again a somewhat similar specimen, differing however in that the upper end has been provided with two shoulders (one of which has been broken off), perhaps to allow a more convenient grip of the stone.

Nos. 24 and 25 are a most highly interesting pair of objects *found together*, I am assured, in St. Kitts, and pre-

PLATE 11

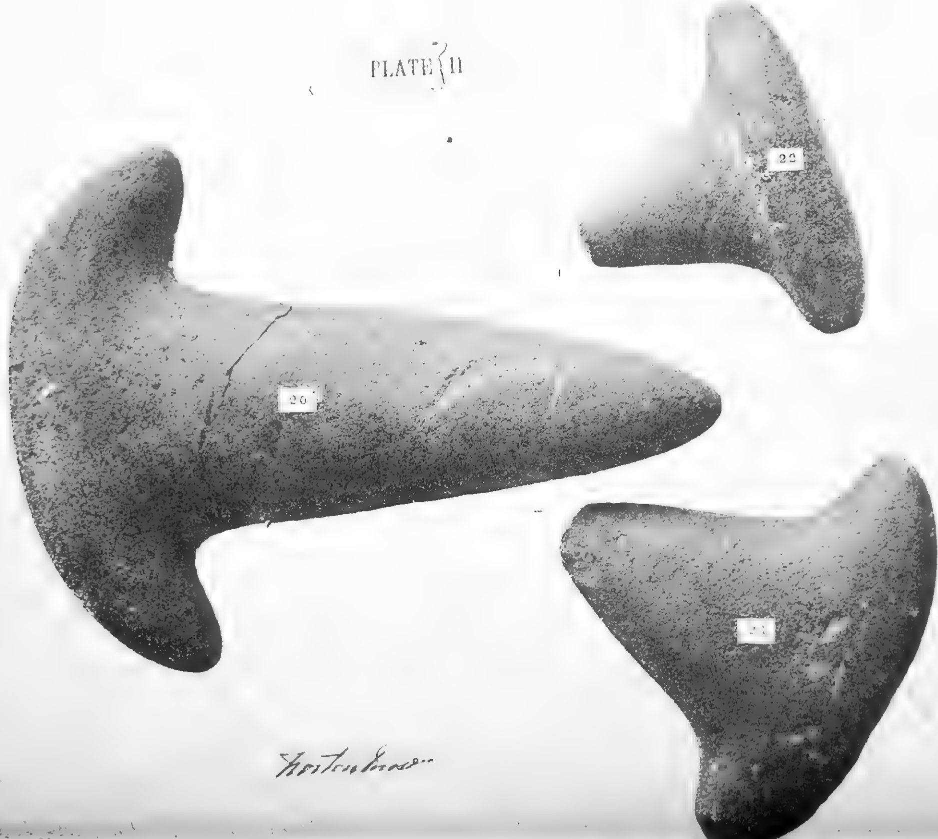


PLATE [illegible]

sented by Mr. KIRTON to Sir THOMAS GRAHAM BRIGGS. The first is a pestle, of no very elaborate form, for the natural pebble has been only just sufficiently shaped to bring it to the required form. The second is a most beautiful and perfect little mortar, corresponding to the pestle. Most people know the imitation birds-nests made—as ornaments or paper-weights—of Cornish serpentine, Derbyshire spa, and similar material. This little mortar closely resembles one of these, and is finished, inside and out, quite as perfectly. It is, however, very tiny ; the cavity is but a half inch deep and but one and a half inches in diameter at the top. Into this cavity, the small end of the pestle, which was, as I have said, found with the mortar, fits perfectly.

This mortar, and, assuming that the two implements really do belong to each other, this pestle, can obviously not have been used for grinding or rubbing either maize or cassava, or any other such bulky substance. Possibly they were used, as is said to be customary among certain Brazilian tribes, as well as among the North American Indians, for rubbing down the paints or dyes used by the owners to adorn either their persons or their weapons and utensils. The chief interest of this suggestion lies in the fact that it lends some evidence to the theory that these West Indian 'pounders' need not necessarily have been used for grinding corn (or any other food substance), and therefore throws some doubt upon the argument, sometimes suggested if not maintained, that because these pounders were owned by the earlier inhabitants of the West Indies, that *therefore* all these people used maize.

Next in the collection, but unfortunately not admitting

of adequate figuring, is a pebble, perhaps entirely natural, perhaps slightly artificially rubbed, exhibiting partially embedded within it, a fossil of considerable size, (possibly, though I do not feel competent to make more than a guess at this, of some Nematoid or other worm form.) The stone was sent from St. Vincent by Mr. F. B. GRIFFITH, under the impression, the grounds for which I unfortunately do not know, that it had been a possession of the old inhabitants of the island. It was also suggested that what seems to me clearly a fossil in it might be some kind of inscription. For my own part I am quite prepared to decide against the latter suggestion. As to the former, it is quite possible that even if the stone is not at all artificially shaped it may yet have been a valued possession of some Red-man of St. Vincent, cherished, on account of its peculiar marking, as an ornament or amulet, If the stone was found among other, undoubted, relics of Red-men, it might safely be supposed to be itself one of these relics. If, as is the case as far as I am concerned, nothing is known of any accompanying relics, it should, I think, only be regarded as an interesting geological specimen. The case is a good illustration of the very great increase in the value of a specimen by a record of its place and mode of occurrence.

Last in the collection we come to the twenty one specimens of implements made not of stone, but of the conchshell. Of these ten are figured (Plate XIII Nos. 26-32 from Barbados and Nos. 33-35 from Nevis).

The larger number of these shell implements (see figs. 26, 27, 28) are fragments of shell just sufficiently shaped to make them available as adzes, which was probably

Barbados
W. E. Taylor
34
29
28
Barbados
W. E. Taylor
35
Nevis

their main purpose, but with all such natural surfaces and curves of the shell as do not interfere with this use left untouched. Such artificial surfaces as are made are, however, not produced by mere rough chipping or splintering, but are carefully ground and polished. A glance at any one of the three examples here figured of this commonest type of shell implement will show justification for a familiar but convenient description of them as of the 'shoe-horn type'. A moment's reflection will show that the concavity of one surface, at the cutting edge of the implement, must have been of distinct advantage to the use of such implements as adzes (picks). The small end, opposite to that at which is the cutting edge, naturally running to a point, seems to have been artificially further sharpened, so as to allow of its use as a pointed drill or awl. In nearly all the examples in my possession this pointed end is abruptly broken off, as if by such use.

The next most common type of shell implement seems to be that of which examples are represented in figures 29, 30, 31, 32 (from Barbados), 33 and 34 (from Nevis). These seem to have been made of the thicker fragments of shell which admitted of sufficient shaving down for the more or less complete obliteration of the natural curve of the shell. These have accordingly been worked up into forms almost exactly corresponding to those of the ordinary wedge-shaped stone implements. Curiously enough one of these (fig. 29) bears a strong resemblance to the stone battle-axe blades of 'Scandinavian type' which have been described in an earlier part of this paper; that is to say, the section would be,—roughly speaking, for one of the flat surfaces is not very flat—rec-

tangular instead of oval. The resemblance to this type is, however, probably accidental, and the implement is probably an adze, not a battle *axe*. To another, but quite accidental, feature in this particular example I shall return later. The examples numbered 30, 31, 32 (from Barbados), 34 and 35 (from Nevis) all fall easily enough into the class of wedge-shaped tools ; they differ, however, somewhat remarkably, the one from the other, in point of size, the smallest, and in this their case is parallel with that of many stone implements, seeming almost too small for practical use.

Fig. 35 represents a shell implement (from Nevis), about which I had at first considerable doubt. For it resembles almost exactly some jaguar-teeth, forming a necklace which, taken from the neck of a Guiana Indian of the present day, hangs on my wall. The upper, or blunt, end is even partially (for the opposite holes do not really meet) bored, just as the jaguar-teeth, used for necklaces, are completely. It was only after close examination of the material of this implement or ornament—it was probably used for both purposes—that I was convinced it was not a jaguar's tooth but an artificial thing of shell. It has, however, I think obviously been made in imitation of a jaguar's tooth, and was meant to be suspended as an ornament in the same way. That the perforation, starting from both sides, is not bored completely through, may be either because the maker abandoned his intention of hanging it from his neck before he had completed the bore, or because it was suspended by a bent piece of metal or curved wood, one of the two ends of which entered each hole.

Some of these shell implements—No. 29 is an excel-

lent example—are very curiously chipped or worn. It seems as though the original owner of No. 29, wishing without breaking up or spoiling for use that implement, to have certain chips to turn into other smaller implements, had simply struck the required flakes from the side of the big implement. It is not difficult to imagine that the flakes which have apparently been removed, very cleanly, from No. 29, may have been used for arrow points or for similar small implements. The remarkable thing, however, is that this economical arrangement should have obtained in Barbados, where there is every reason to believe that an abundance of shells, material for any number of implements, were at hand. It has indeed been suggested that these fractures of the surface of implements, as in the example brought forward, are not due to any intentional removal of flakes but are caused by rubbing, the implement having, according to this theory, been used as a sort of grindstone (hone ?), on the flat surface of which, unimportant enough to the main use of the implement, the cutting edges of narrow chisel-like implements have been ground. But a close inspection of the clean edged fractures shows, plainly enough I think, that they were caused by the sudden removal of flakes. This removal of flakes may of course not have been intentional, may have been caused by blows accidentally received; but where, as in our example, a number of these flakes have been removed, side by side, from one implement, it is, I think, safe to infer that the removal can not have been accidental.

The following remarks by the Rev. GREVILLE J. CHESTER, published by Mr. STEVENS in his "Flint Chips"

(p. 235), on Barbadian shell implements may well find a place here:—

"In Barbados there is no hard stone, nothing harder than coralline limestone; the aborigines therefore were obliged to import *hard* stone implements from the other islands, or from the main continent of South America. For ordinary purposes, however, they used implements made of various kinds of marine shells, and of the *fossil* shells from the limestone. These shell implements vary in length from one and a half to six and a half inches; some in my possession are beautifully formed. In the commonest type the natural curve of the shell formed the handle. Discs and beads made of shell, and large quantities of pottery in a fragmentary state, have been found associated with the shell implements. The use of an implement somewhat resembling a hone has not been satisfactorily ascertained, only one specimen * out of the considerable number which have passed through my hands being worn down by use. The large number of implements discovered under rock-shelters, and in gullies, proves the existence of a large native population in Barbados; and as shell hatchets are not found in the other West Indian Islands, it is clear that they are of purely local origin. In the parish of St. James several cart-loads of shell implements were found lying together; they were carried away to macadamise a road. Near the chapel of St. Luke, in a small gully, at the very centre of the island, I picked up seven shell implements in the space of ten minutes, as well as a quantity of pottery. The favourite spots for the habitation of the shell-workers seem to have been under rock-shelters, at the entrance of caves in the limestone rocks, and upon the sloping sides of the numerous "gullies" which form the most characteristic feature of the scenery in Barbados. "Indian River" in St Michael's parish, the neighbourhood of the fresh water springs on the borders of St. Michael's and St. James's, and the springs on the Codrington College estates in St. John's, appear all to have been centres of population."

One passage in the above remarks requires correction. It is obvious from the evidence brought together in these pages that the use of implements of shell was not peculiar to Barbados. The old inhabitants of Nevis certainly

* This specimen is now in the Christy Collection, British Museum.

used these also; and from a passage, which I have already quoted (see *Timehri*, vol. ii. p. 254-5), in a letter written to me by Mr. E. L. ATKINSON of Trinidad it seems highly probable that these implements were used on some of the Grenadines also.

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4. Up to February in the present year (1884), in the course of much digging and collecting of the stone and other implements of the old inhabitants of Guiana, I had met with surprisingly few pieces of pottery; nor had I even heard rumours of any large deposits of such objects. In fact, the instances of the occurrence of pottery known to me up to that time were, briefly, these. In 1877, in digging a shell mound at Pirakka, on the Pomeroon River, I found a few fragments of a clay vessel which had apparently differed from the ordinary and very simple cooking vessel (buck-pot) of our modern Indians only in that it had been of better clay and had not been stained black. Again, at the end of last year, in digging some shell from the kitchen-midden at Cabacaboori, also on the Pomeroon River, for my tennis court, my men found a small and broken animal mask of clay, which might have been a boss, or other ornament, on some clay vessel. And about the same time, my friend Mr. HEARD, who lives at Cabacaboori, dug up from the same midden two fragments (which he kindly gave to me) of what appeared to be a tile of baked clay; these, however, more probably were parts of a slab-like piece of pottery (the same utensil was more frequently made of sandstone and is now almost always made of iron) on which the flat

cakes of bread (cassava) were baked.* These were the only three instances in which I had actually seen pottery which had been dug up in British Guiana. But Mr. BARRINGTON BROWN in his "Canoe and Camp Life in British Guiana," mentions certain sites of ancient villages occurring in the far interior, distinguishable from the surrounding country, not only by their rich black soil, but also by the abundance of broken fragments of pottery occurring in this soil. This may be compared with the accounts of similar places occurring in the Amazon district. For instance, Mr. HERBERT H. SMITH in his book "Brazil, the Amazon and the Coast" makes mention of many places where black earth occurs thickly interspersed with fragments of pottery and stone implements. Mr. BARRINGTON BROWN'S "sites of ancient villages" seem to be similar deposits; but, in the course of a considerable amount of travel through most parts of the colony, I have never been fortunate enough to meet with such a 'site.'

But last January, Mr. RASHLEIGH PORTER of Pln. *Enmore*, on the east coast of Demerara, who had even before that sent me certain stone implements found on a reef at the back of that estate, sent me some grotesque clay figures, of a highly artistic kind, found by him on the same reef. These figures at once attracted my attention; and, at Mr. PORTER'S kind invitation, I spent two days at *Enmore*, examining the place from which this pottery had come, and procuring a large

* Since the above was written I have learned that the Indians about the Waini River have, up the present time, been in the habit of occasionally making baking slabs of clay.

number of specimens which Mr. PORTER was kind enough to present to me.

About a year ago, a new depth, behind the old back-dam, was taken into cultivation at *Enmore.* The new land was almost entirely swampy pegass, the ordinary "wet savannah" of the coast region of this colony. But running through this swamp for some considerable distance, parallel to, but, if I am not mistaken, at a distance of at least ten miles from, the present sea-line, is a natural reef of sea-shell evidently representing a former coast-line. Here and there along this reef a few trees had taken root and made as it were, islands in the sea of savannah grass. And where these isolated groups of trees occur, their leaves, continually dropping, have formed a deposit of pure black soil, slightly raised above the general level of the reef, and consequently still more above the level of the savannah. On one of these tree islands, situated in a direct line from the buildings at *Enmore* at a distance of about five miles, stand two very fine silk-cotton trees (*Eriodendron anfractuosum*) and a considerable number of hog-plum trees (*Spondias lutea*). It is in the soil of this island that most of the pottery as yet found has occurred. A few were, however, found in a somewhat similar island a few hundred yards to the right of that first mentioned. Again, as I myself saw, considerable numbers of fragments of rough pottery—though I saw none there of an ornamental kind—lie on the ground on another 'island,' on which the trees have recently been cut down, considerably more to the right, at the back of *Bachelor's Adventure.* These three deposits seem to be all of a very similar

character. * As the same reef must extend very much further along the coast than I was able to follow it, and as these raised islands probably occur at irregular intervals along the whole course of the reef, it would be interesting to know whether the whole, or if not that, how much of this reef, bears a deposit of pottery. †

At present I propose to confine my remarks exclusively to the pottery found in the two islands, directly behind *Enmore* itself. It is there hardly possible to turn over the soil without meeting with fragments of pottery; and, indeed, the soil immediately around these islands, having but recently been dug and planted with canes, many fragments are strewn here and there on the surface of the ground. The pottery still undisturbed is, like that lying on the surface, in a very fragmentary condition and is much mixed with human bones, together with a few bones of fishes, and with certain curious lumps of hard substance, possibly clay, possibly wood. ‡ On digging, it at once becomes apparent that the pottery may roughly

* The only differences I have been able to detect as yet are that in the island behind the *Enmore* buildings and in that immediately to the right of it, stone implements occur very sparingly, while they seem to be much more abundant on the island behind *Bachelor's Adventure*; and, on the other hand, artistic pottery seems to be much more abundant on the *Enmore* island than elsewhere. But both these differences may prove to be more apparent than real.

† Since this was written, the Honble. B. HOWELL JONES has found, and has exhibited before the Society, certain pieces of pottery, of apparently similar nature to those which I am now describing, at Pln. *La Bon Père* on the Mahaica Creek. It seems highly probable that similar deposits exist along the whole of that coast.

‡ I must emphatically point out that these deposits of pottery, &c., are not, in any sense, kitchen middens (shell-mounds).

be distinguished into two kinds. The one kind is of a coarse and thick character, and occurs so associated with human bones as to lead almost inevitably to the belief that the place has been a burial-ground of some people who were in the habit of burying their dead in urns or jars. The second kind, as plentiful or even more so, consists of fragments of finer, and apparently smaller, vessels, such as may probably have been used as drinking-cups, water-bottles, cooking and food vessels.

As regards the coarse pottery, it is especially unfortunate that it seems impossible to find a whole vessel. But whenever it seems to be in an undisturbed state—*i.e.* whenever it does not seem to have been recently thrown up and dispersed in the course of sugar cultivation—the fragments occur in groups so disposed as to suggest the idea that each heap represents a whole vessel, which had been placed in its present position intact, but had afterward been broken down from above by the weight of the superincumbent earth. And in the middle of each of these so flattened-out jars occurs a heap of human bones, each heap apparently representing an entire body. That many American tribes, in common with many peoples in a similar stage of civilization in others parts of the world, buried their dead in jars—or rather, after temporarily disposing of the bodies of their dead until the flesh had been separated from the skeletons, afterward placed these bones in jars, and so buried them—is well known. And that among the American tribes who did this may be numbered the Caribs of the West Indies seems probable from an account, to which I have already alluded in a previous number of *Timehri* (Vol. ii., p. 254),

of a Carib cemetery (in which the bones are found enclosed in small clay urns), in the island of Balliceaux, one of the Grenadines. As I shall presently be able to give almost certain proof that the pottery at *Enmore* is of Carib origin, it seems, putting all these things together, that we may safely assume the *Enmore* island to have been a Carib burial place.* The burial-jars, if such was there nature, were, to judge from the curves of the fragments found, of considerable size—large enough perhaps to hold all the bones of a skeleton, though not an entire, undisintegrated skeleton—very thick in substance, and seem to have been unornamented. Examples of the coarse pottery are shown on Plate XIV., Nos. 1 & 2.

A question naturally arises as to why the finer vessels are present if, as has been suggested, the place is a cemetery and the larger vessels were deposited with the bones of the dead. Two suggestions may be made on this point. In the first place, it is the well known custom of almost all primitive people to bury with the dead various utensils, weapons, and even food, with the idea

* Most unfortunately a possible chance of ascertaining the position in which the bodies were buried was lost. Just before I was at *Enmore*, Mr. PORTER noticed, embedded in the earth clinging to the roots of an upturned tree, an entire, or nearly entire, skeleton. Knowing that I was to visit the spot in a few days, he left this undisturbed for my inspection. But before my visit, some one had discovered the skeleton, pulled it out and dispersed the bones. Again, since the above was written, the Honble. B. HOWELL JONES, on apparently a similar island on the same, or a similar reef, at the back of Pln. *Le Bon Père*, found an entire skeleton to which some of the hair still adhered; but this too was destroyed without the preservation of even a few hairs, which would have been of great value.

PLATE 14.

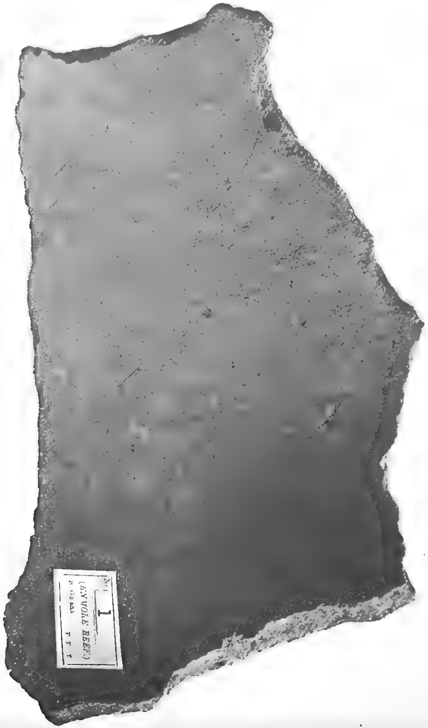
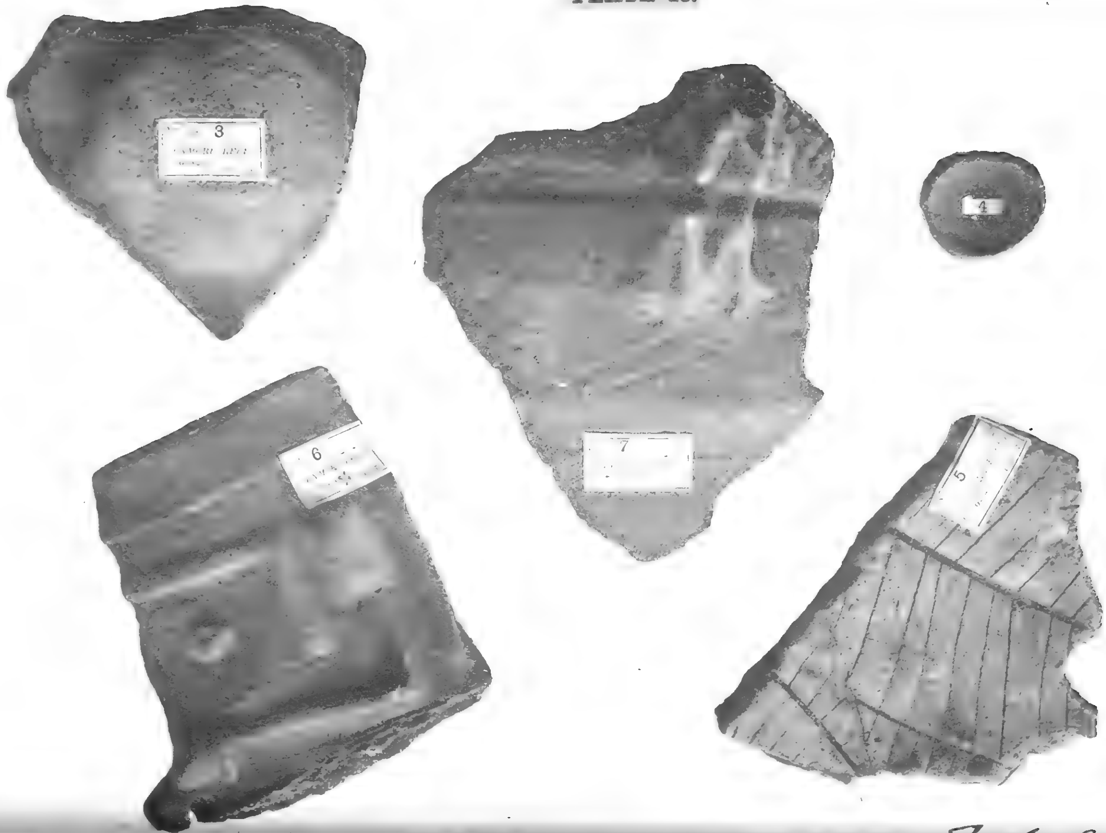


PLATE 15.



that the ghosts of the departed carried with them to ghost-land the ghosts of these utensils and weapons. This might, therefore, quite naturally account for the presence of this finer pottery with and among the burial jars. And secondly—though this is a mere suggestion—it was the known custom of certain American tribes of jar-buriers, to place the coarse vessels which formed the immediate depository of the bones of the dead within finer and more ornamental vessels, and then to bury the whole; but the fact that at *Enmore* the vessels of finer workmanship were, certainly in many cases, smaller than the coarse funeral jars suffices to show that some of the vessels at least must have been deposited with, and not enclosing the dead.

The finer of the two kinds of pottery is even more interesting. Of this, too, very few fragments of any large size have been found. The most complete of the vessels found is a simple bowl-shaped vessel approaching in form the food-vessel (sappoora) used by the Caribs and allied tribes at the present day. A small boss still remaining on one side of it, and certain lines on the fragments of its rim—which were found inside the vessel—seem to show that it had some sort of ornamentation. Various very tiny vessels—some hardly big enough to fit the top of one's thumb (see Plate XV, No. 4)—of this shape also occur; and this is noteworthy owing to the fact that toy vessels, or model vessels, exactly similar except in size to the larger kinds, are found in most deposits of pottery throughout the world, notably in the mounds of North America. I have elsewhere* explained that the occurrence of these miniatures

* See "Among the Indians of British Guiana," London, 1883, p 275.

is probably due to the fact that the children of those who made these deposits, just as do the Indian children of the present day, were in the habit of imitating their mothers when they saw them at their potters' work. Few of the other *Enmore* fragments seem to have belonged to vessels closely corresponding in shape to the monotonously unvaried pots and vessels of the Indians of the present day. Among the fragments evidently belonging to vessels differing entirely in shape from any now in use among the Indians of Guiana are certain flat and uncurved pieces, like portions of tiles (see No. 5). These can hardly really be fragments of tiles; for Indians can surely have had no use for such objects. And they are too thin to have formed parts of the baking-slabs which, as has already been indicated, Indians did, and do, use. They are, in fact, exactly like the fragments of vessels except that they are uncurved, as, at first sight, it seems necessary that a fragment, however small, of a vessel must be. But there is a form of vessel which occurs "quite frequently in the pottery of the entire Atlantic Coast" (of North America), writes ABBOT, in his "Primitive Industry," (p. 176, ed. 1881), in which a round bowl or "belly" is surmounted, above where it contracts to form a neck, by a square top. Judging from fragments in my possession, it is almost certain that the Caribs at *Enmore* possessed at least a few vessels of this peculiar square-topped form. Another form of vessel evidently in use by the people of the *Enmore* island, but entirely unrepresented by anything now used by the Indians, was apparently mug-shaped (see No. 6). At this moment I cannot recall instances of the occurrence of vessels of this form from any other part of America. Yet

another variation, in the *Enmore* pottery, from the modern forms of Indian vessels, is to be noted in the fact that they often, though certainly not always, had thickened bottoms (see No. 3), whereas in the modern Indian pottery the bottom is either of the same thickness as the sides, or, if it is occasionally somewhat thicker, it passes not abruptly, but tapers down only gradually, to the greater thinness of the sides. Even at *Enmore* the thickened bottom is, however, more common in the 'burial jars' than in the finer pottery. In short, in shape and make the *Enmore* pottery differs from that of the modern Indians of Guiana, but differs slightly less from the pottery of the 'True Caribs' of Guiana and the allied tribes than it does from the pottery of the other, or, as I have elsewhere called them,* the native tribes of Guiana.

But a yet greater peculiarity of the *Enmore* pottery, as occurring in Guiana, lies in its ornamentation. The adornment of primitive pottery may be said to be achieved by three methods: (1) by the painting, or more often the staining, of patterns, (2) by the production of patterns by means of either raised or incised lines, dots or other marks, and (3), most rarely, by luting on figures in high relief.† The Indians of the Guianas of the present day very rarely ornament their vessels

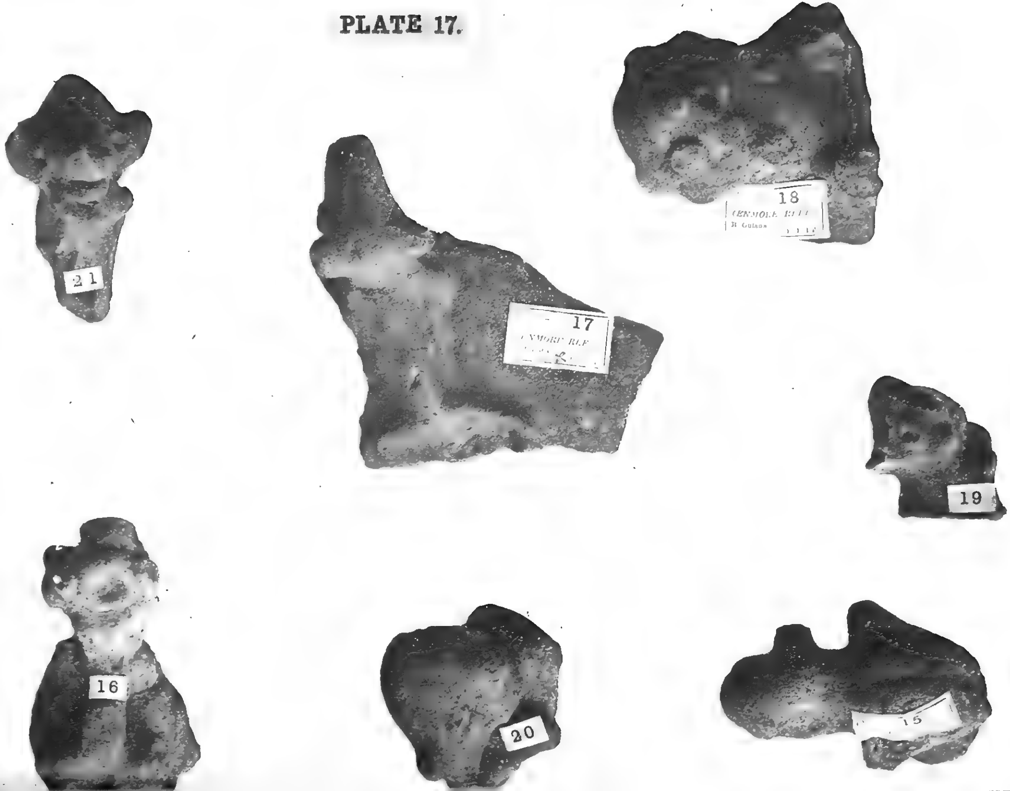
* "Among the Indians of British Guiana" p. 171.

† It may not be out of place here to note, by the way, that the evolutionary history of pottery is probably as follows; first the pot is left entirely plain and unadorned; next, corresponding with a slightly higher stage of civilization, it is stained or painted; next it is ornamented by raised or incised patterns; and, lastly, by the luting on of highly raised figures, each of these stages in the potter's art corresponding with a higher stage in general civilization.

except, and the exception is chiefly by the Caribs, by painting or staining them; very occasionally, however, a projecting rib is seen at the base of the neck of a modern water-vessel (goglet), and this too is the work of Caribs; and, again, only since I was at *Enmore*, have I seen for the first time a similar vessel, also made by a Carib, ornamented with a series of indentations round its mouth, made by pressure with the tip of the finger on the unbaked clay. There is, therefore, little attempt made by the modern Indians of Guiana to ornament their pottery; but such attempt as is made, is made chiefly, if not solely, by the Caribs of the colony.

On the *Enmore* pottery there is no trace of ornamentation by painting or staining; this may, however, be due to the fact that long burial in the earth has obliterated all traces of the colouring matters, usually of a not very adhesive kind, so applied. But a large number of the fragments are ornamented, with very unusual elaboration, with both raised and indented patterns. I am almost inclined to think that all the vessels were perhaps so ornamented, and that the numerous unadorned fragments found are all from the lower parts of vessels the rims of which—for the ornamentation in most American, perhaps in most primitive, pottery is, I believe, confined to the upper parts or rims—were ornamented. This ornamentation by raised or incised patterns is fairly common throughout America, especially northward, among the tribes of middle civilization. Very excellent illustrations of it may be seen in plates 15 & 16 of the 15th volume of the "Transactions of the American Philosophical Society" (1880), where the late Professor HALDEMAN, to whose daughter, Madame Figyelmesey, I am greatly indebted

PLATE 17.



for a copy of the paper in question, has beautifully figured certain specimens discovered by him in the 'rock-retreat' at Chickies, Pennsylvania. The pottery with raised or incised ornamentation from Enmore here shown (Nos. 7–11), is much of the same type as the Chickies specimens, except that in a few of the pieces (*e. g.* No 7.), *in addition* to the incised patterns, a further ornament (with which we shall deal presently) is luted on. In No. 6, I am not sure whether the ornament is simply raised or is luted on; but if the former it is still of higher type than the Chickies specimens in that the raised figuring evidently represents no mere unmeaning combination of dots and lines but some object the nature of which is not easily discernible in so fragmentary a specimen.

One very curious form of ornamentation, represented in the *Enmore* find by one well marked, and several partially obliterated fragments, though it must probably be classed among the incised patterns, is of very peculiar character (No. 5). It has evidently been produced by impressing on the wet, as yet unbaked, clay certain large leaves; to give an illustration which will be widely recognized, a very similar pattern might be produced by pressing the leaves of the common horse-chestnut on to any surface of soft clay. In a volume of the "American Antiquarian," p. 78 (but I unfortunately can not say what year), Prof. HALDEMAN notices, evidently as something new to his great experience, that "I may mention seeing a fragment of clay pottery from Virginia, upon which a leaf (probably hickory) had been impressed before burning". This pattern, at *Enmore*, occurs on some of the flat fragments to which allusion has already been

made as probably the flat portions of a squared-topped vessel. So far we have found nothing in the *Enmore* pottery which raises it to any much higher type than that of some of the higher uncivilised races of North America.

But the pottery with which we are dealing rises to a stage far higher than that of mere raised and incised patterns; for much of the ornamentation is by means of most artistically wrought grotesque figures, heads, faces and whole bodies of men and other animals, which have evidently been, in some few cases still are, luted on to the vessel, by way of ornament and handle combined. Such are Nos. 12 to 21, all of which deserve special notice. No. 12 is the half length figure of a man, leaning on his elbows, his hands pressed against his cheeks, who must have leaned out from the pot to which he was luted, much as a gargoyle leans out from an old English church. Indeed the grotesque conception of many of these clay figures strikingly recalls that of the gargoyles. No. 13 most artistically represents the whole body of some animal, to which, however, very life-like as is the modelling, it is not easy to give a name. No. 14 represents an animal in much the same position and style; but it is either a different animal or, as is most probable, both figures represent a mere grotesque, such as existed only in the imagination of the potter. Nos. 15, 16, and 17 also show the whole figure of grotesque animals, as does the handle on No. 7, to which allusion has already been made. In Nos. 7 and 16 is shown a somewhat different kind of handle, occurring commonly enough at *Enmore*, which is pierced and thus made more convenient; in the examples under notice the desired end is achieved by modelling an animal with its upper and lower extremities touching the

vessel, its middle standing out as a loop-like handle. Nos. 18–21, are much caricatured human heads and face. Another example, not figured here, is more probably the stopper of a water-bottle (goglet) than the handle of a vessel. Yet another is a fragment of a vessel showing the paws of one of the figure-handles, though the figure itself is wanting.

Leaving out of consideration the pottery of the civilized races of America, as for instance of the Peruvians and Mexicans, in which similar and even much higher ornamentation is attempted, clay figures, comparable with those from *Enmore* are, I believe, known only from one area in America, and presumably, as the work of one people, the Caribs of the West Indian islands. Nor are specimens of this Carib pottery very abundant. But in the National Museum of the United States, at Washington, is a magnificent collection of old Carib relics, gathered together from Porto Rico and the neighbouring islands by Mr. GEORGE LATIMER, for many years a merchant, and consul for the United States, first in St. Thomas and afterward in Porto Rico. A profusely illustrated report, by Professor OTIS T. MASON, on this collection, is given in the report of the Smithsonian Institution for 1876 (pp. 371–393), in which, among other objects, are described and figured various fragments of pottery almost exactly similar to those from *Enmore*. Moreover, while referring to this report on the LATIMER collection, it may be worth while to note that, as is abundantly evident from the study, not only of this but also of any collection of Carib relics, including both pottery and stone implements, the ornate figures which adorn, and form the characteristic of, the more elaborate Carib stone implements,

are absolutely identical in grotesque character and conception with the Carib potter's figures. The style, in fact, whether applied to clay or stone, is peculiarly and characteristically the Carib style. There can, therefore, be little doubt that the *Enmore* pottery is the work of the same old inhabitants of the West Indian islands, known as Caribs And, as if to set at rest any doubt that might remain on the point, one of the very few stones showing traces of treatment by human hands which have occurred in the *Enmore* deposit, is a piece of pure coral, which certainly was not found naturally in Guiana, and which was, almost as certainly, brought from the West Indian islands.

And if the *Enmore* pottery is thus the work of some of those same Caribs whose best known home was in the West Indian Islands, it may be pointed out that the theory, on which I have already written at length* that the Caribs now with us reached the mainland from the islands, rather than, as some have maintained, that the Caribs reached the islands from Guiana, receives strong confirmation. For, seeing that Carib pottery of this high type occurs so sparingly in Guiana that but one deposit of it has as yet, after all these years, been discovered, and seeing moreover that this pottery, as to a still greater degree do the higher types of Carib stone implements, occurs much more abundantly, even if still sparingly, in the islands, taking, I say these things into consideration, it is much easier to believe that one party or a few parties, of Caribs, after they had developed the high degree of civilization indicated by this pottery, reached Guiana and formed this deposit at *Enmore*, than that

* "Among the Indians of British Guiana" p. 171, 287, 417.

certain Caribs having developed this high degree of civilization in Guiana, then passed over into the islands, leaving here so few traces of their civilization that only this one deposit of their pottery has as yet come to light, while they spread the relics of their civilization with such comparative liberality in the islands.

Artificial Manures for Sugar Canes.

By A. R. Gilzean.

IN hard times for the proprietors of sugar estates when the estimates of expenditure have to be very carefully considered, the large sum usually expended on manure catches the eye as an item that might be reduced or removed. Many properties have been successfully managed with the use of artificial manures while others have paid equally well without their use. The proportion of estates that use manure is very much in excess of those that do not; and as the intelligence employed in the management of Demerara estates is of no mean standard, this must be received as evidence in favour of its use. It is, however, necessary to consider, whether or not there is a likelihood of the majority having been deceived into following a wrong course. When the use of artificial manure was discontinued on an estate on the East Coast of Demerara most planters thought the result would be disastrous. The opposite has proved to be the case. In my experience the result of the application of nitrogenous manures to alternate beds in some cases has been that the manured beds when young looked as if they would give fifty per cent. more cane than the unmanured ones, but when ripe it was impossible to distinguish any difference. This disappointing result has generally taken place in comparatively new land, but it has also been noticed in old land. On first becoming a manager, I was convinced that the use of manure paid, and went to work to prove

it by experiments. Having gone on with these for ten years, I have come to the conclusion that it is impossible to arrive at any definite judgment from experiments made with the means at the disposal of most managers. Systematic experiments are being carried out on estates in the colony owned by a large company, and it is said that valuable facts have already been arrived at, but, of course, these are private property. To show the value of such experiments, I think I may state that they are said to point to two important conclusions, viz., that the usual manner of applying lime to our fields is not the best, and that the application of manures in certain years of the rotation of the cane crop is a mistake. Carefully conducted trials would enable planters to decide what kind of manure is likely to be most remunerative if it is proved that any are. There is no doubt that, at present, we are, to a considerable extent, groping in the dark.

It is well known what great benefits have accrued to the farmers in Scotland from scientific experiments with manures, conducted by qualified persons, employed by Agricultural Societies. Although individual companies or proprietors with large interests can afford to investigate for themselves, owners of smaller properties cannot. No doubt all the estates' proprietors would be glad to share the cost of a thorough investigation of the matter, but, unfortunately, they are not united in a society in the colony that could deal with such a matter. If the Royal Agricultural and Commercial Society would take the matter up, it would be certain to carry it to a successful conclusion, and add a great benefit to those it has already conferred on the colony.

The Hon. WILLIAM RUSSELL kindly put the services

of his chemist, Mr. J. OWEN ALEXANDER, at my disposal to help me with my last two experiments with manures. With Mr. ALEXANDER'S leave, I have much pleasure in appending his tables and remarks, in the hope that they may prove of some interest to planters, altho' it is not possible that such solitary experiments can do much more than start an interest in the subject.

Results of manured plots on Field No. 48 at the backdam of Richmond, Plan. Anna Regina, Essequebo, 21st Dec., 1883.

Name of Manure Applied.	Amt. Manure applied to $\frac{1}{16}$th acre in lbs.	Weight of Canes cut from $\frac{1}{16}$th acre in lbs.	No. of Tops obtained from $\frac{1}{16}$ of an acre.	100 Canes.					100 Canes.				Weight in tons of Canes per acre.	Galls. juice obtainable per Acre at 74 o/o expression.	Tons Dry Sugar obtainable per acre at 70 o/o return from Indic'd Sugar in Juice.	Cost of Manure per acre, in dollars.
				Crystallizable Sugar.	Glucose.	Fibre.	Ash.	Water and organic matter.	Crystallizable Sugar.	Glucose.	Ash.	Water and organic matter.				
Acidulated and Ammoniated Guano	185	4286	373	16.10	1.26	10.70	.53	71.41	18.14	1.31	.61	79.94	30.85	5074	2.87	65
Ohlendorff's Guano	130	3643	370	15.27	1.58	11.49	.37	71.29	17.33	1.80	.42	80.45	26.22	4313	2.32	65
Ritchie's Manure	180	2708	389	16.42	.81	12.45	.18	70.14	18.80	.93	.21	80.06	19.50	3206	1.88	65
Superphosphate of Lime	200	2089	292	14.87	1.33	13.09	.24	70.47	17.16	1.54	.28	81.02	15.00	2473	1.32	65
Os Ammonite	140	3998	515	14.88	1.10	11.00	.42	72.60	16.80	1.36	.48	81.36	28.75	4733	2.48	65
Dis. Peruvian Guano	125	3608	320	15.99	.97	12.36	.26	70.42	18.31	1.12	.30	80.27	25.95	4271	2.44	65
No Manure	...	2125	354	16.92	.99	14.12	.19	67.82	19.62	1.11	.22	79.05	15.30	2510	1.53	...
Ammoniated Phosphated Dis. Guano	120	3428	259	14.83	1.69	11.62	.29	71.57	16.82	1.92	.34	80.90	24.65	4058	2.13	65
Phosphated Guano	145	2685	356	15.71	1.23	13.18	.22	69.66	18.15	1.50	.26	80.06	19.30	3179	1.80	65
Cane Manure	140	3988	440	15.71	1.25	11.37	.45	71.22	17.82	1.42	.48	80.24	28.70	4722	2.62	65
Nitrate of Soda	100	4073	439	15.30	1.40	11.65	.57	71.08	17.44	1.60	.66	80.30	29.32	4822	2.62	65
Equal parts Sulph. of Ammonia and Superphosphate of Lime	100	3632	505	14.52	1.79	12.59	.27	70.83	16.67	2.06	.32	81.93	26.12	4300	2.32	65
Equal parts Sulph. of Ammonia and Ohlendorff's Guano	120	3969	350	15.88	1.36	12.11	.33	70.34	18.14	1.56	.40	79.90	28.35	4699	2.65	65
Sulphate Mixture	100	3890	414	14.87	1.13	12.30	.60	71.10	17.08	1.30	.69	80.93	28.00	4605	2.44	65
Sulphate of Ammonia	80	3808	469	14.46	1.39	10.60	.56	72.53	16.18	1.56	.62	80.64	27.40	4508	2.28	65

Results of manured plots on Field No. 22 at the backdam of Henrietta, Plan. Anna Regina, Essequebo, 7th April, 1884.

Name of Manure Applied.	Weight of Canes in lbs. cut from 1-20th of an acre.	100 Canes. Crystallizable Sugar.	100 Canes. Glucose.	100 Canes. Fibre.	100 Canes. Ash.	100 Canes. Water and organic matter.	100 Canes. Crystallizable Sugar.	100 Canes. Glucose.	100 Canes. Ash.	100 Canes. Water and organic matter.	Weight in tons of Canes per acre.	Galls. juice obtainable per Acre at 74 o/o expression.	Tons of Dry Sugar obtainable per acre at 70 o/o return from Indic'd Sugar in Juice.	Cost of Manure per acre, in dollars.
Acidulated and Ammoniated Guano	2164	16·64	·86	11·12	·33	71·05	18·80	·98	·37	79·85	19·32	3202	1·88	16
Ohlendorff's Guano	2102	15·50	·99	10·83	·27	72·41	17·44	1·12	·30	81·14	18·76	3111	1·69	16
Ritchie's Manure	2137	16·67	·51	13·06	·28	69·48	19·24	·60	·32	79·84	19·08	3162	1·90	16
Superphosphate of Lime	1629	15·42	·61	13·31	·22	70·44	17·84	·71	·25	81·20	14·54	2531	1·40	16
Os Ammonite	2483	15·34	·68	11·70	·32	71·94	17·44	·78	·36	81·40	22·17	3675	1·99	16
Dis. Peruvian Guano	2721	15·59	·78	12·33	·23	71·07	17·84	·90	·26	81·00	21·16	3509	1·95	16
No Manure	$\frac{3}{20}$ths acre 4826	16·31	·59	13·94	·21	68·95	19·00	·69	·24	80·07	14·35	2379	1·41	...
Am. & Phos. Dis. Guano	2414	15·58	1·07	11·40	·28	71·67	17·65	1·22	·31	80·82	21·55	3572	1·96	16
Phosphated Guano	2461	15·72	·68	13·08	·25	70·27	18·14	80	·28	80·78	21·97	3642	2·06	16
Cane Manure	2356	16·68	·70	12·11	·35	70·16	19·06	·81	·39	79·74	21·00	3486	2·07	16
Nitrate of Soda	2114	16·21	1·08	11·20	·43	71·08	18·31	1·23	·48	79·98	18·87	3128	1·78	16
Equal parts Sulph. of Ammonia and Superphosphate of Lime	2222	15·98	·82	12·38	·32	70·50	18·31	·95	·36	80·38	19·82	3288	1·88	16
Equal parts Sulph. of Ammonia and Ohlendorff's Guano	2161	16·08	·77	11·92	·30	70·93	18·31	·88	·34	80·47	19·09	3198	1·82	16
Sulphate Mixture	1933	15·17	·93	12·66	·35	70·89	17·44	1·08	·40	81·08	17·25	2860	1·55	16
Sulphate of Ammonia	2242	16·30	·95	11·32	·41	71·02	18·47	1·08	·44	80·11	20·00	3318	1·90	16

Richmond Trial Plots.

Acidulated and Ammoniated Guano, Os Ammonite, Cane Manure, Ammoniated Phos. Dis. Guano, Dis. Peruvian Guano, and Phosphated Guano, are all of much the same composition, viz. Dissolved Phosphate containing from 20 to 30 per cent. of Sulphate of Ammonia ; the first-mentioned has given the best results. Comparing these manures with *Nitrate of Soda alone* on begass land, such as we have dealt with on this trial, it may be seen at a glance, that it is not Phosphates or Potash etc., that are required, but an oxidising agent like Nitric Acid ; this is present in an active form in Nitrate of Soda, and it will render soluble any mineral matters and oxidise soluble Salts of Iron and so give rise to a healthy growth. I have always been of this opinion and I am now more fully convinced of it than ever. It is evident that the canes on the other plots have derived their nourishment almost entirely from the manure, this is the case with Nitrate of Soda also, only the nourishment has been obtained in an indirect manner, as I have already mentioned. *Sulphate of Ammonia and Sulphate Mixture* have done very well, the latter contains about 20 per cent. of Chloride of Potassium consequently the ash is lighter than in the other samples, deliquescent salts of this nature in the juice are very often the cause of "bad" sugar. I am of opinion that plants absorb Nitrogen to a great extent in the form of Nitric Acid, hence the reason that Sulphate of Ammonia acts more slowly than Nitrate of Soda. When Sulphate of Ammonia is applied, the Ammonia has first to be converted into Nitric Acid before it can be absorbed. The plot manured with *Ohlendorff's Guano* was not a fair trial. I consider that this is a first-rate Guano. Sulphate of Ammonia adds to its effect. *Superphosphate of Lime alone* has not done well, this was to be expected. Superphosphate is very good for replenishing the soil, but its effect is slow when used by itself. I have no idea what is the composition of *Ritchie's Manure*, the results are not very good. It is interesting to note, that the unmanured plot has given the sweetest canes. Finally I am of opinion that the results on a whole are not good, the land at present is not in a condition for expensive manuring like this ; what is wanted, is deep draining and heavy "liming."

Henrietta Trial Plots.

These plots I think have given better results than those on Richmond ; the increase in Sugar per acre with $16 manure is about half a

ton, while the Richmond increase with $65 manure per acre is only one ton. *Ritchie's manure* has done much better this time. The following is the analysis of Henrietta soil. Judging by the eye, this soil looks better "cured" than that of Richmond.

	per cent.
Water	8·310
* Organic Matter	17·408
Silicious Matter	66·840
Alumina...	4·200
Ferric Oxide	·814
Ferrous Oxide	·083
Lime	·266
Sulphuric Acid	·110
Phosphoric Acid	·122
* Containing Nitrogen	·280

This is a very rich soil, all it wants is the application of Lime to decompose the large amount of sour vegetable matter it contains.

General conclusions arrived at.

(1.) That the ash and glucose are both increased in proportion to the amount of manure used, and that the increase is greater the more highly nitrogenous the manure is.

(2). That the stronger a manure is, the less there is of fibre in the cane.

(3). That canes appear to require chiefly Phosphoric Acid, Sulphuric Acid, and Nitrogen, that the best way to apply them is by Dissolved Guano mixed with Sulphate of Ammonia.

(4). That it is difficult to give the preference to any of the manures of this nature used in these trials. I consider it is more satisfactory to import a good simple Dissolved Guano and mix it on the estate with Sulphate of Ammonia.

(5). That Sulphate of Ammonia and Nitrate of Soda will stimulate canes when applied alone; but their addition must always be accompanied with the burial of the "trash," when this is done I consider there is no fear of the Soil becoming exhausted by their use.

(6). That I am of opinion that Nitrate of Soda is better for young canes than Sulphate of Ammonia, because its action is quicker. The canes are stronger at their birth, so to speak, and consequently are more able to stand droughts and heavy rains in their after life.

(7). That Begass Soil does not require any other manure than Lime or Shell.

J. OWEN ALEXANDER,
Chemist to The Hon. Wm. Russell.

Occasional Notes.

DR. SCHOMBURGK.—A well deserved honour has recently been paid in Adelaide, the city of his adoption, to Dr. RICHARD SCHOMBURGK, whom we also, here in Guiana, honour as having been for a brief but eventful time one of our most prominent colonists and one who, by his scientific explorations, made in company with his brother Sir RICHARD, of the then unknown interior of this land, did such excellent service to Guiana. In a previous number of *Timehri* we have given an autograph letter in which Dr. SCHOMBURGK tells something of what his life has been since that long past day when he left the shores of Guiana, and tells how he is now, and has for many years been, the honoured, Curator of the Botanic Gardens of Adelaide. In September last, at a meeting of some of the friends and admirers of Dr. SCHOMBURGK, it was determined to procure and place in the Museum of Economic Botany, which is a most valuable addition to the gardens wholly due to the exertions of Dr. SCHOMBURGK, a portrait of the esteemed and honoured curator. The painting has since been executed by Mr. L. E. TANNEST, the master of the School of Art. It was formally presented to the Board of Governors of the Gardens on the 30th of January last by Sir WILLIAM ROBINSON, Governor of South Australia, in the presence of Dr. SCHOMBURGK and a large company of his well-wishers. With characteristic modesty, he whom that ceremony was meant to honour, in expressing his thanks, dwelt chiefly on the merits of his

predecessor in the curatorship, who planned and designed the gardens so wisely that the after labour has, according to Dr. SCHOMBURGK, been comparatively light. He also dwelt on the fact that the cordial and earnest support of the members of the Board of Governors of the gardens had been of the very greatest assistance to him in his labours. He added—and those who have authority over our own gardens may, on the fortunate day when they have sufficient funds at their disposal, take a hint from the remark—that "the founding of this Museum of Economic Botany has been one of the many objects of my great solicitude. The high estimation in which, I feel proud to say, it is held by the public, and the never failing interest it excites and maintains would have been a substantial reward for all the pains I have taken to make it what it is."

Indian Children's Games.—The games of Indian children, when untouched by European civilization, appear, as I have elsewhere said, tentative imitations of such things as will be their serious occupations in after life—hunting and fishing in the case of the boys, cooking in the case of the girls. But there must be in these, as in children elsewhere, a natural element of mere sportiveness, however indiscernible this may be to the eye of the stranger. For as soon as these children are brought nto contact with civilization, either at the mission stations or elsewhere, as soon, that is, as the stern necessity of learning to hunt and learning housewifely cares is no longer allowed to occupy their whole time, then the

natural sportiveness develops. I have lately been watching certain Indian children in this half-civilized condition. One Ackawoi boy who lives with me, seems as playful as any happy English child. One of his amusements is to catch a sandwasp, and, having tied to it one end of a long fine hair, to the other end of which a bright coloured flower or a scrap of paper is fastened, to let the insect go again, and then to chase it, just sufficiently flower-burdened as it is to prevent its either flying too fast or falling too easy a prey. Or this same boy amuses himself by stripping the green part from a cocoanut leaf leaving only the branched woody midrib, and on this he threads innumerable corollas of bright flowers, making the whole into a brilliant fan. Or, at other times he plaits palm leaves into fantastic crowns, or makes of them eccentric boxes and baskets. Once, too, at a mission I watched a boy—there appeared to be only one who could do it—who running on all fours as fast as the others could on their two legs, chased his companions and almost invariably caught them, the whole party being clamorous, throughout the game, with shouts of joy. And at this same mission I once saw the children play for a whole evening at a most organized game, which they must have been taught; it was a version of our own childish game of 'oranges and lemons'; each player as he was caught being asked whether he would join, not the oranges or the lemons, but the sun or the moon.

Animism.—In our remote forest house, surrounded as we are by none but Indians, quaint little instances illus-

trative of animism are constantly presenting themselves. Here are two. When the wind has blown strongly during the night and has shaken the hammocks, the boy and girl Indian servants not unfrequently complain that 'people' came to their hammocks during the night and shook them. The second instance is perhaps still more quaint. A 'mocking bird' (*Cassicus persicus*) having been caught and tamed was brought to a house near by which is a colony of wild birds of the same sort. Some of the wild birds visited the tame one. Upon which an Indian maiden remarked that if the tame one was not watched the wild one would come and poison it!

Couvade.—The Professor to whose semi-belief in the possible reasonableness of couvade (*Timehri* p. 160 Vol. 2) as the consequence of a possible real physico-sympathetic connection between a man and his wife, has called my attention to the very similar view held by a recent correspondent of the "Academy," to which paper a member of the Folk-Lore Society writes:—

"In Mr. York Powell's interesting and able review of Grimm's *Teutonic Mythology* (ACADEMY, February 23) reference is made to the universal belief among our English and Irish peasantry 'that a man will suffer from such ills as are wont to accompany pregnancy, nausea, neuralgia, and the like, if his wife be lucky enough to escape them.' Just to show that folk-lore is in many cases but a too free and illogical argument based on facts, I may perhaps be allowed to say that I am to-day acquainted with three persons, one living in Sussex, one in London and one in Northants, who invariably suffer from neuralgia or vomiting when their wives are *enceinte*, the ladies themselves having a very happy time of it."

While on this subject I may as well insert the following note on the derivation of the word *couvade* from a recent

letter from Mr. E. B. TYLOR. "You asked once about the derivation of *couvade*. Answer, French (Provincial, south) from *couver* to hatch, as if the man hatched the young brood. At least, that is something near the way in which the word shaped itself. It is in fact the same word as our covey, French *couvé*, a hatching or brood."

Fascination.—In connection with a note in the previous number of *Timehri* on 'fascination by snakes,' a correspondent sends the following:—

A little sunbird* &c., &c., which although it had been deprived of one eye seemed to make double use of the remaining one, softly and solemnly marched from end to end of the marble slab, and no sooner did a fly alight than up it went within striking distance. At times it made a hissing noise, but not always. Having quietly got its beak within an inch or so of the fly, it made an unerring dart and the poor fly was between its mandibles and swallowed; in this way the pest of flies is kept down, and judging from the rate at which its work was carried on thousands of flies must form the daily meal of this nimble bird. That the sunbird has the means of fascinating the housefly, there cannot be a doubt; for the tropical housefly is smartness itself, as every dweller in these latitudes can testify who has been tormented by the titillation of these insects and the all but impossibility of killing them.

Meteorology of Guiana.—Since and except the very careful and elaborate "Monthly Tables of Daily Means of Meteorological Elements deduced from Observations taken at the Observatory, Georgetown, British Guiana, ... during eleven years, commencing January 1846,

* *Eurypyga helias.*

with remarks on the state of the Weather, Clouds, and other Phenomena" by PATRICK SANDEMAN, Observer (Greenock, 1857), very little, or indeed nothing has been done to examine and record the meteorology of this colony, a neglect the more to be regretted in that a knowledge of this kind, such as might be deduced by the vastly improved, if still very defective, modern methods employed in the science would be of inestimable value to those on whose industry we are so often told the colony rests—the sugar-planters. On most estates a record of the rainfall is kept, but most imperfectly; and even where it is adequately done the results are very seldom published for general information. We therefore feel an unusual obligation to the Hon. ARTHUR BRAUD of Pln. *Mon Repos* who has supplied the following concise record of the rainfall on that estate during the twenty years commencing with January 1864.

Rainfall for Twenty years, Plantation "Mon Repos," East Coast.

Mo's.	1864	1865	1866	1867	1868	1869	1870	1871	1872	1873	1874	1875	1876	1877	1878	1879	1880	1881	1882	1883	Mean.
Jany...	4·32	3·53	12·80	4·08	2·45	3·07	20·77	11·47	3·18	4·40	5·47	4·70	9·35	4·08	2·33	10·48	9·34	5·06	5·74	3·36	6·50
Feb....	1·57	3·31	9·98	3·97	2.22	·99	5·13	5·06	1·04	2·82	10·05	3·60	2·50	1·94	·55	5·74	10·37	1·29	1·08	2·84	3·80
March	1·12	7·30	4·01	6·06	4·67	2·24	2·14	2·80	2·16	·21	5·10	2·05	·95	7·65	3·08	12·90	11·34	2·56	9·19	1·24	4·49
April...	4·04	20·59	5·29	1·08	7·29	3·81	4·37	8·72	4·58	2·33	9·56	3·42	2·85	5·87	4·61	7·40	1·77	6·59	6·71	6·39	5·86
May...	7·89	14·66	6·93	9·31	8·30	7·93	10·68	6·65	13·90	·40	11·05	7·34	9·59	11·89	10·62	2·15	12·45	15·79	14·27	6·56	9·42
June...	8·10	8·54	15·36	10·74	6·20	17·20	12·17	9·08	10·34	7·73	10·87	8·50	13·58	7·27	11·33	7·77	11·86	7·39	10·03	11·06	10·26
July ...	8·23	8·90	9·30	6·76	3·87	5·92	8·48	5·92	7·57	6·51	8·45	8·74	8·88	4·99	7·90	16·30	1·91	4·59	5·90	13·42	7·63
Aug....	8·80	8·90	6·22	7·18	1·78	4·57	9·07	7·60	2·26	3·10	4·72	11·01	8·13	5·04	8·34	2·59	9·04	7·33	6·87	3·11	6·28
Septr..	3·21	7·41	1·20	1·54	·58	2·04	·50	·55	4·75	1·48	...	·72	8·47	1·38	·95	1·66	·10	·82	·64	·60	1·93
Octr...	1·00	7·38	·08	·39	·10	·35	2·08	·92	1·50	2·76	4·55	4·60	4·34	·48	·10	1·07	2·88	·55	2·86	1·02	1·95
Novr ..	3·85	5·02	10·50	4·87	3·50	8·59	6·09	8·52	12·84	2·87	10·40	8·94	2·63	3·85	·23	4·69	11·99	6·37	5·36	·79	6·09
Decr ...	6·72	15·11	5·77	8·25	3·97	17·19	15.48	4·06	16·34	17·81	15.70	11·95	6·28	6·55	13·97	19·40	1·71	12·49	11·27	5·31	10·77
Total.	58·85	110·65	87·44	64·23	44·93	74·90	96.96	71·35	80·46	52·42	95·92	75·57	77·55	60·99	64·01	92·15	84·76	70·83	79·92	55·70	74·98

Local Literature.—From time to time it falls to our lot to record the production of new books under this heading. Generally these are books dealing with the colony itself, in some of its many aspects. But at present we propose just to notice two little books which, though their subject is not the colony, may be regarded as in very peculiar degree colonial productions. They are two small volumes of poems, only intended for private circulation, the one, entitled "What you Will" and dated at Georgetown 1881, the other entitled "Abassa: a Play, and Poetical Pieces," dated at the same place but in 1883. These books have been made—made in most unusually comprehensive sense—by a young creole of the colony, who modestly desires to be mentioned only by the initials of W.M.E.P., to dispel the dreariness of a long illness. The writer is his own author, printer, publisher. Each little book, is, as far as printing is concerned, the work of six months, occupying four hours daily; they were produced with a 'chase' of a size, and type sufficient, for the impression of only one page at a time, so that after each page was printed (there are 112 in the one, 197 pages in the other book) the 'form' had to be broken up and the same type set for the next page, the maker within a few hours exercising the various duties of compositor, pressman, devil, proof-reader, editor, *et cet.* As truly wonderful instances of perseverance, and as products of a most happy inspiration for the driving away of the weariness of illness, these little books surely deserve warm words of praise.

Extension of Cultivation in Dominica.—In Dominica, as in British Guiana, there are some who advocate the

opening up to cultivation of tracts of country at present unused. With a view to this object, an expedition, under sanction of the Government, has recently explored certain tracts in the interior of Dominica known as the Layou Flats, and has issued a report on the result of their observations. A copy of this report has been forwarded to us; and from it we quote the following particulars :—

" Masses of mountains, some attaining to the height of nearly 5,000 feet, occupy a considerable portion of the north and south divisions of the island ; but in the centre is a break in the mountain system, and at this break are situated a series of plateaux, all having local names, but known generally as the Layou Flats. These plateaux stretch diagonally across the widest part of the island, at elevations varying from 500 to 1,000 feet above the level of the sea ; in places they are broken by ravines and low mountain slopes, but for the most part, the land is flat and undulating. . . . . . A reference to Byre's plan of Dominica . . . . . will show that the Layou and Sara Flats, which appear to have been carefully surveyed, comprise together an area of not less than 40 square miles.

. . . . .

" These lands belong to the Crown, they are covered with primeval forest, and they are well watered by four rivers. . . . . . The basins of these rivers are separated from each other by low watersheds which offer no serious obstacles to road engineering. . . . . As far as can be at present judged, the road should be made through the basins of the rivers Layou and Clyde ; and as these are the two largest rivers in the island, it follows that such a line would open up the greatest extent of country, besides which it would connect the rich Lasoye district directly with the leeward coast, thereby doing much to develop the trade and agriculture of the island.

" The forests of these interior flats contain trees of great value for building purposes, some of them furnishing hard woods and cabinet woods of considerable strength and beauty."

Then follows an enumeration of some of the most desirable woods and of the uses to which these may be

applied. Many of the trees in the list do not occur in Guiana; but it also includes our familiar Greenheart (*Nectandra Rodiæi*) and, by name at least, our bullet tree or balata. As regards the greenheart, and indeed as regards the whole of the timber, it not unnaturally occurs to us, dwellers in so huge a forest, that the quantity to be obtained, even under the most favourable circumstances, from an area of only 40 square miles, is of comparatively little moment. As regards the so-called balata, which is said to be the same as our well known tree but which is identified as *Bumelia retusa*, it may be pointed out that our balata, though belonging to the same family, is a *Mimusops* not a *Bumelia*.

Suggestions are also made as to the artificial products which might be cultivated on these flats - amongst others sugar, cacao, coffee—especially the Liberian variety—spices, rice, oranges, tobacco, and cattle. Having ourselves but very weak faith in the *indiscriminate* application of 'mixed cultivation' we are inclined, so far as we may judge from the report which lies before us, to recommend the possible future cultivators of the Layou Flats to confine their attention to the growth of oranges and the production of cattle; *possibly* tobacco might also be cultivated with advantage.

The trade in oranges which has recently so greatly increased between the West Indies—and Dominica has taken a prominent place in the movement—and the United States, promises better results, it seems to us, than almost any other of the newer West Indian industries. The rearing of cattle, which is hardly attempted in the West Indies, might certainly be carried on

with very unusually good results wherever, as we are assured in this report is the case on the Layou Flats, "cattle might be reared with advantage on large pastures that could easily be formed." And as regards tobacco, though personally without any knowledge of the prospects held out by this kind of cultivation, we confess we feel somewhat allured by the statements in this report to the following effect :—

" As regards climate, elevation and richness of soil, the lower parts of the flats are eminently adapted to the cultivation of tobacco. Indeed, when the Lesser Antilles were first settled, tobacco was the principal cultivation on the freshly cleared lands. Some years ago, the late Dr. Imray made experiments in the cultivation, and he forwarded samples of Dominica-grown tobacco to Kew for a report as to its value. The report so obtained was most favourable ; a large tobacco merchant in London having informed Sir Joseph Hooker that a country able to produce such tobacco had a mine of wealth in it. Already in Jamaica tobacco culture is a pronounced success, and the Jamaica cigars are justly esteemed as scarcely inferior to that of Cuba. The cultivation of tobacco is being taken up in St. Lucia, and there is no reason whatever why it should not succeed in Dominica.

New Plants from Guiana.—The well-known specialist in orchid-lore, H. G. REICHENBACH Jnr. has recently published, in the *Gardener's Chronicle*, the following descriptions of three new species of orchids, all collected by Mr. BURKE, on behalf of Messrs. VEITCH & SONS, in the neighbourhood of Roraima, during the summer of 1881.

STELIS ZONATA, *n. sp.*—This is near *Stelis muscifera* of Dr. Lindley, but smaller in all parts, and interesting by its coloured zone. Its stem is short. The very thick leaf is cuneate, oblong, blunt. Peduncle with numerous sheaths and a one-sided raceme. Sepals light ochre, with a rich cinnamon base. Petals with an abrupt ochre margin and ochre base, a fine mauve mid-zone. Lip ochre, with glandular cells on the abrupt anterior border. Column mauve, with an ochre zone over

its dorsal mid-line. It was imported from Demerara, by Messrs. J. Veitch & Sons.

Stelis zonata n. sp.—Affinis S. musciferæ, Lindl.; caule folium cuneatum oblongum rotundatum non æquante; pedunculo folium bene superante, infra dense vaginato; racemo densifloro secundo; bracteis arctis acutis; sepalis basi connatis oblongis obtusiusculis; 5-nerviis; tepalis transversis apice abruptis; labelli lamina triangula utrinque angulata; zona antica abrupte incrassata retusa granulata; columna antice tricorni. Ex Demerara imp. cl. Messsrs. Veitch. *H. G. Rchb. f.*

MASDEVALLIA BREVIS, *n. sp.*—Messrs. J. Veitch & Sons have sent me a specimen of this new introduction from British Guiana. It is of great botanical interest to see this variation from the well-known types of Masdevallia ochthodes and macrodactyla. The present plant is far more slender, the leaf is smaller, the flower shorter, and the lateral pair of sepals quite ventricose. The upper sepalis of fine yellow, with three rows of dark purple spots, the thick tail dark purple. The lateral sepals are divided into unequal halves by the lemon coloured keels running over the median nerves, prolonged into the lemon coloured, slender, long, subulate tails. The anterior superior area is orange with purple, the other three quarters are brown. The irregular rhomboid petals are chacterised by an inflexed apiculus. Colour yellowish and brown. The long narrow lip has a distinct stalk and a pandurate blade, whose anterior part is neatly fimbriate, as well as the anterior parts of the blade above and which bears two fimbriate crests.

Masdevalia brevis, n. sp.—Aff. Masdevalliæ ochthodi, Rchb., f., sed omnino gracilior: folio cuneato oblongo obtuse acuto; peduncelo gracili racemoso; flore brevi; sepalo impari galeato triangulo in caudam crassam longiorem extenso; sepalis lateralibus navicularibus connatis supra nervum medium carinatis, in caudis subulatas acuminatas extensis; tepalis obtusato-rhombeis irregularibus, apiculo inflexo; labello unguiculato angusto pandurato, partitione antica fimbriata, superiori etiam antice fimbriata utrinque fimbriato-carinata; columnæ alis suboblongis minute lobulatis. Ex Demerara imp. cl. Veitch. *H.G. Rchb. f.*

ZYGOPETALUM BURKEI, *n. sp.* A very interesting plant, discovered by Sir ROBERT SCHOMBURGK more than forty years ago in Demerara, as is proved by the itinerary records of this traveller kept at the British Museum. Specimens, however, appear to have been lost altogether, provided they are not mislaid and come one day to light. It is well known that a great part of Sir R. SCHOMBURGK's treasures was

lost *en route.* Lately the plant has appeared with Messrs. J. VEITCH & SONS, having been rediscovered by Mr. BURKE, a well-doing traveller, as I learn from Mr. HARRY VEITCH, who requested that the plant might bear the name of its collector.

These first flowers are only two-thirds the size of what they will become later. Sepals and petals of finest darkest blackish-purple inside, with green signatures, partly linear, partly hieroglyphical, quite green outside. Lip white. The callus on the base, however, has thirteen purple ribs, which makes a very pretty effect.

The column is of light whitish-green, with numerous dark purple longitudinal lines in front, but with no hairs at all.

The linear auriculæ to the column, the very thick leaves, and the nearly tetragonous shining bulb, exceeding 2 inches in length, are very peculiar.

Zygepetalum Burkei. n. sp.—Pseudobulbo tetragono costis obscuris solitariis inter angwlos, triphyllis ; foliss pergameneo-coriaceis ; pedunculo plurifloro (ad 5) ; sepalis subbilabiatis, lateralibus deflexis, margine interno supra involutis ; tepalis subæqualibus ; labello breve unguiculato, ante unguem utrinque auriculato, dein ligulato antice dilatato obtusato ; callo inter auriculas 13 jugo ; columna utrinque apice lineari auriculata.—Demerara, ROBERT SCHOMBURGK, BURKE! (Viv. mis. cl. Veitch.) *H. G. Rchb. f.*

Insect Pests of Orange Trees.—The following valuable report on a species of *Coccus* found by Mr. JENMAN on orange, and other trees in this colony should have appeared in the previous number of *Timehri* :—

ROBERT MCLACHLAN TO SIR J. HOOKER.

Westview, Clarendon Road, Lewisham, London, S. E.,
23rd Aug. 1883.

To Sir J. D. HOOKER, K. C. B. ; F. R. S., etc., etc.
Director of Royal Gardens, Kew.

Dear Sir Joseph,—I have the honour to report on certain portions of branches of orange from British Guiana forwarded through the Colonial Office which are greatly infested with a "scale insect" or "coccus."

The insect in question belongs to the (genus) of coccida termed Diaspis and it did not appear to accord with any previously described species of that (genus). I forwarded it to my friend Dr. Victor Signoret of Paris, who has made the systematic classification of coccida his special duty. He is of opinion that it is undescribed, and has recently, I believe, bestowed upon it the name of " Diaspis aurantie."

Three samples of portions of branches were submitted to me labelled respectively " orange", Bhal (?) and " lime" : of these the orange appears to be the least affected and the lime the most, but in all cases the scales are so thickly placed as to nearly obscure the bark. The same species of " scale" infests all three, but at first sight there appear to be two different kinds, one large and dark in colour, the other much smaller and whitish. The larger " scales" are those of the female insect, the smaller those of the male.

The life history of scale insects may be briefly stated as follows :—

The eggs (which are very numerous) are deposited by the female under the scale she has secreted and under which she herself lives for the greater part of her life. These eggs soon hatch (the time varying according to the temperature) and the young larvæ wander forth. This period of activity is of very short duration probably never more than a day or two and at its end the larvæ settle down on some portion of the plant affected and commence secreting the " scales" under which the female lives for the whole of her remaining existence and the male until it is ready to assume the perfect state in which it is a very minute whitish two-winged insect (but in many species of Coccida, the male is unknown and the generative condition known as " parthenogenesis" probably obtains). In hot climates, such as British Guiana, it is probable there may be three or four generations in each year, but this can only be determined by local observation. It is of importance that the short period of activity immediately after emergence from the egg should be borne in mind, for it is possilbe that at this period the insect can be more readily attacked by remedial measures.

Remedies may be mainly sought under two categories " mechanical" and "insecticides," and in connection with these I would earnestly advise those interested in orange culture in British Guiana to consult the report of the entomologist of the United States Department of Agriculture for the year 1880, by J. Henry Comstock (1881), and the report of the entomologist from the annual report of the same depart-

ment for the year 1881, by Charles V. Riley (1882), both issued from the Government Printing Office at Washington. Both may be consulted with advantage, and the more so as the two authors did not work in concert, and their ideas are not always identical in the means proposed. In Professor Riley's report he has been aided by the practical experience of Mr. H. S. Hubbard, who devoted himself specially to the subject. In the Southern United States the attacks of "scale" on oranges has become of national importance; and experience there, and in British Guiana should be nearly identical, although the particular species of scale insect injurious in the British colony does not appear, to have been observed in the States.

Of mechanical measures, one of the most importance is that of brushing the part of the trees infested with a brush sufficiently strong to remove and destroy the scales without injuring the bark. It must rest with orange planters in the districts affected to consider how far this can be successfully done, in which the height of the trees and the comparative freedom from scale of the leaves and fruit must be taken into consideration; cutting back or lopping and burning the affected portions of the tree might also be tried, though this naturally checks the supply of fruit until new wood is produced. Stimulating by powerful manures so as to enable the trees to outgrow as it were the attacks of the insect, has also been recommended, but it is possible that this may tend to an over-production of young wood and leaves, and a diminished supply of fruit. Finally, there is the radical remedy of stamping out by destroying all the infested trees and beginning again. This might occasion ruin or severe loss to poor planters, and would probably require a Governmental subsidy to the parties affected for a considerable time. In connection with this it is desirable, whether the planters should not ask themselves if the trees have become naturally in an unhealthy condition, and the soil exhausted through continuous growing of the same trees on the same ground. It appears to me possible that rotation of crops may be as necessary in the case of cultivated trees or shrubs as it has been proved to be with cereals and herbaceous plants, and on this point I think the American reports before alluded to, are not sufficiently explicit.

The number of the insecticides that have been tried is very great. Some of them have proved impracticable owing to their destroying both the plants and the insects, others again have proved only partially successful or have been very difficult of application or too expensive. It seems

then that those to be seriously considered are very few. To be effective they should consist of solutions of such a nature that can be applied by means of a force pump, so as to reach every part.

Whale-oil-soap in a solution of one pound of soap to one gallon of water is reported to have killed all the insects, but only few of the eggs; it must be applied hot, as it solidifies in cooling, and it is recommended that the operation be repeated several times at short intervals.

The most effective of all insecticides is termed Kerosine Emulsion, the formula for the preparation of which is here given :—

Pure kerosine,	1 gallon.
Condensed milk,	$1\frac{1}{2}$ pints.
Water	3 pints.

Mix the milk and the water before adding the oil and churn until the whole solidifies and forms a "butter." In applying this preparation the kerosine "butter" should be diluted with from 12 to 16 times its quantity of water and then be applied immediately, for, if it is allowed to stand, the "butter" rises to the surface and the solution is imperfect. The results of experiments with this are stated by Mr. Hubbard to have been satisfactory and he gives it the preference over all other insecticides. It should be remembered that it is possible (I might say certain) the insects can be more readily combatted by insecticides during the very short period in which they are active, just after emergence from the egg (attention has been directed to this already in this report); local observation only can define this short period.

No remedial measures can be of much value unless as the result of concerted action. The care of one planter may be utterly neutralized by the neglect of another, his neighbour. Therefore it is desirable that if after the trial success has been obtained, the application of such a remedy should be made compulsory universally and not be left to individual discretion.

Insect "pests" are (with few exceptions) endemic and epidemic in the same locality. They are always present, and so long as they continue endemic and limited in their numbers the injury sustained is but small and may even in certain cases become an actual benefit by checking over production. It is when the epidemic condition shews itself that the real injury is inflicted. The epidemic condition may be only transitory or it may prevail to such an extent as to destroy or permanently damage the plants.

It is therefore desirable to keep up a healthy condition, and if in spite

of this the plants still shew themselves liable to destructive attacks it is more than ever necessary to enquire whether their constitution has not been deteriorated by long continued cultivation on the same spot without rotation.—I have &c.,

(Signed) ROBERT MCLACHLAN.
F. R. S., F. L. S.

A Difficulty of Botanical Collectors.—There is a difficulty which all who have collected herbarium specimens in but little explored lands must have felt and lamented. It is that it is almost impossible to get plants of certain, and among these some of the most interesting, genera examined and named. It is seldom that the collector himself has the time or knowledge, or if he has these that he has the opportunity—for instance that he has command of the necessary books, to name his own plants. He therefore probably sends them to some such establishment as that at Kew, to be examined and determined. But at Kew, as in more or less degree at similar establishments, the scientific men employed, despite their ability and zeal, are unable to cope with the abundant material forwarded to them from all parts of the world; and they therefore deal with certain plants, those belonging to genera in which any of the scientific workmen concerned feel some special interest; but all the other plants are simply drafted, labelled with the name of their discoverer and the place and date of their discovery, but without any critical examination, into what appears to be their approximate place in the herbarium, there to lie until, perchance in a few cases, some new specialist interested in their particular genera may examine them. There are certain genera of plants which, in that they

are the most difficult and, perhaps consequently on this difficulty, in that no specialist has devoted his attention to them, are especially unfortunate in this respect. To mention only a few instances, and those of families occurring abundantly in Guiana, he must be a very sanguine collector who cares to gather herbarium specimens of *Aroideæ, Palmæ, Pandaneæ* (including our abundant and very interesting *Carludovicas*) or *Bignoniaceæ*; for, until and unless some specialist chances to come and take some interest in these orders, the collector's labours will be wasted. Finally, to give a particular instance of this heartrending difficulty to enthusiastic collectors, I may quote the following words from a letter recently addressed to me by a botanical friend—"You seemed to doubt . . . . when I told you that nearly all our orchids were *Epidendrum variegatum*; but at Kew they are just as bad. All our *Gongoras* they make a *tropurpurea*, all the *Rodriguezias* (they make) *secunde*, and all the thin stemmed *Epidendrums*—including our little one with the Dendrobe-like stems—*imatophyllum*." The terrible putting together of perfectly distinct things indicated in the above extract can probably only be appreciated, and fittingly lamented, by one who knows the plants to which reference is made in their natural state.

Figures of Guiana Orchids.—Following that useful piece of advice 'when found make a note of', we insert the following references to figures and descriptions of Guiana orchids included in the last issued parts of that long interrupted work the "REFUGIUM BOTANICUM."

In the absence of any collected account of the plants of Guiana, botanical students are always glad to know where to seek for the many scattered and fragmentary accounts. The references are as follows:—

" Maxillaria Desvauxiana, Rchb. f., *Refg. bot.*, t. 134. Cayenne, New Grenada.

" Pleurothallis ciliata, Knowles and West.; Rchb. f., in *Refg. bot.*, t. 142.—Demerara.

" Pleurothallis floripecten, Rchb. f. *Refg. bot.*, t. 118.—Venezuela.

" Zygopetalum rostratum, Rchb. f., *Refg. bot.*, t. 106.—Surinam.

Report of the Meetings of the Society (January—June 1884).

Meeting held 10th January.—The Honourable B. Howell Jones, President, in the chair.

Elections.—*Members :* M. B. Jamieson; W. B. Winter; F. Abraham ; A. Duncan ; G. Pearce ; Rev. G. Salmon.

Associates : A. Lennox ; J. Macfarlane ; W. Macdonald ; A. W. Ord ; G. R. Proudlock.

The Proposed Forestry Exhibition.—The President stated that the Government had addressed a letter to the Society asking the Society if they would undertake to organise an expedition in connection with the Forestry Exhibition to be held this year in Edinburgh. The Committee had decided to undertake it with the assistance of the Government, and the Committee referred the matter to the Committee of Correspondence, as was usually done in such cases. There had been no answer given to the Government, relative to a question in their letter, as to who should represent the colony at the Exhibition ; but at next meeting he should propose that if the hon. Wm. Russell, President of the Committee of Correspondence, went home, he be requested to represent the colony at the Exhibition.

Cane Crushing and Megass as Fuel.—The President said that a paper was to have been read at the last general meeting by Mr. Russell, and it was postponed in order that printed copies of the paper might be placed

in the hands of the members; that had now been done, and he called upon Mr. Russell to read his paper.*

Mr. Russell accordingly did so, and added he had touched upon three of the most important things connected with sugar planting—the first was to grow a rich sweet cane, the next thing to take the most out of it, and the last was to burn the megass as it left the mill. To do this appeared to him to be perfectly easy; it could be done by simply increasing the power of their mills.

The President suggested that the discussion of the paper be left over till next meeting to allow the members to digest the matter Mr. Russell had given them, and to afford them an opportunity of looking at the figures and calculations Mr. Russell had given, as well as to bring forward figures and calculations of their own.

The late Mr. Campbell.—The President said it had already been proposed that they should have a suitable memorial of their late Secretary, Mr. Campbell, in the form of a bust or painting, and he would suggest further that enquiries might be made in order to ascertain what would be the cost of producing an engraved portrait, as many of the members no doubt would like to have in their possession such a memorial of Mr. Campbell.

The Biennial Exhibition.—The President speaking in reference to the Biennial Exhibition of the Society which takes place this year, said he did not think they could commence too soon making arrangements and he should give notice that at next general meeting he should move that a committee should arrange for the forthcoming exhibition of the Society.

* The paper, in a revised form, will be found in the present number of *Timehri*, p. 48.

It was understood that the Committee of Correspondence would take the matter in hand.

Treasurer's Accounts.—The Treasurer (Mr. R. W. Imlach), laid over the accounts of the Society to 31st December last, showing a balance at credit of $2,689 60; also the account in connection with the Museum to the same date, showing a balance at credit of $3,364 19; and an account of the expenditure of the vote for the Biennial Exhibition, showing a balance at credit of $1,997 55.

These accounts were ordered to be referred to Mr. Glennie and Mr. Godfrey to be audited.

Proposed Sales of Periodicals and old Books.—Mr. Nind gave notice that at next meeting he would bring forward a motion with regard to the sale of books belonging to the Institution. A great many periodicals disappeared altogether; and there were a good many books of inferior value in the Institution: he would move that the Book Committee examine the books of the library twice a year, and condemn those that were useless, to be sold, the proceeds to be devoted to binding certain selected periodicals, and the purchase of books published in the colony and in connection with it.

Donations.

An engraved portrait of Mr. Humphry Crum Ewing.—By the President.

A map of the City of Calcutta.—By the Immigration Agent General.

"Poems" by "Leo".—By the Author.

"Among the Indians of British Guiana", by E. F. im Thurn.—By the Author.

The meeting then dispersed.

Meeting held 14th February.—The Honourable B. Howell Jones, President, in the chair.

Elections—*Members:* F. W. Elliott; W. M. Campbell; T. Kelly, M.D.

Associates: H. S. Cox; G. T. Bom; G. Pym; S. A. Hill; E. A. Pairaudeau; W. D. Calder.

The Forestry Exhibition.—It was proposed by the President and unanimously carried, that the hon. Wm. Russell should be asked to represent the colony at the Forestry Exhibition to be held in Edinburgh this year.

Sale of Useless Books, et al.—Mr. Nind brought forward the motion of which he had given notice:—

That the Book Committee examine the condition of books in the Library at least twice a year, and be authorised to offer for sale at public auction or otherwise, any books, magazines, pamphlets &c., which they decide it is undesirable to retain in the Library, and that the fund formed by these periodical sales be devoted to the binding of such magazines, &c., as the said Committee shall think fit, to the replacing of any damaged books of value, and to the purchase of works bearing on the history of the colony, or in any way connected with it.

He referred to the practice of allowing valuable and practical periodicals which ought to be bound in volumes and retained as books of reference, to be given away as literature no longer of any interest to the Society, a magazine like the *Sugar Cane* being sent to the Hospital and Sailors' Home to amuse the inmates. On the other hand there were many books on the shelves which the Society should try to dispose of, and out of the money obtained from the sale of such books and from the sale of ephemeral periodicals, a fund could be formed for the binding of periodicals worth keeping and for replacing damaged books.

The motion was supported and adopted, it being

decided, however, that before any periodicals or books were disposed of, a list of them should be laid before a general meeting.

The Biennial Exhibition.—The President suggested that so much labour and expense had been necessary recently in connection with the Calcutta Exhibition and the Forestry Exhibition, he thought that the local Biennial Exhibition which should be held this year should be postponed to next, and undertook to bring forward a motion on the subject at the next meeting.

A Further Paper from the Hon. W. Russell.—The Secretary said he had received a telegram from Mr. Russell intimating that at the next meeting he will read a paper upon "accidents due to sudden vacuum."

Letters to the Secretary.—The Secretary then read a letter from Mr. Walker congratulating him, Mr. Conyers, on his appointment as Secretary, and thanking the Society for re-appointing the writer as resident Director in London. Also a letter from the editor of the *Planter & Farmer*, Brisbane, with which had been forwarded a file of the said newspaper—with a view to an exchange of information on questions affecting the production of the sugar cane.

Donation of valuable books.—The following letter from Mr. Kirke, Emigration Agent, Calcutta was read :—

Sir,—Before the late Mr. Firth left Calcutta, he pointed out to me certain books in his library which he had bought with the intention of presenting them to the Royal Agricultural and Commercial Society of British Guiana. His unexpected death prevented him from carrying out his intention, but I am sure I shall be fulfilling his wishes by forwarding the books to the Society. I have spoken to Mr. Warner who is Mr. Firth's sole executor, and he fully shares my opinion, and Mrs Firth will be only too glad to carry out her deceased husband's wishes ;

so I have forwarded the books (a list of which is given below) addressed to you by the ship *Ganges*, which left Calcutta on the 1st of December. I hope the Society will find them a valuable addition to its library :—

Bolingbroke's voyage to Demerara; Marabunta; Hindoo tribes and castes, 3 vols; Edward's History of the West Indies, 6 vols.; Stedman's Surinam, 2 vols,; Pinckard's West Indies, 3 vols,; History of the West Indies, 5 vols.; Eight years in British Guiana; The West Indies, by Davy; Gurney's Winter in the West Indies; and The West Indian sketch-book, 2 vols.

The Secretary was directed to tender the thanks of the Society to Mrs. Firth for her very handsome contribution to the library.

Mr. Coster on The Sugar-cane as Fuel.—Mr. Coster read the following paper, entitled

THE SUGAR-CANE AS FUEL.

Some notes on the subject and a few remarks on the Hon. Mr. Russel's paper, by Maurice I. Coster, M.E.

It is a known fact in chemistry, that every chemical combination is accompanied by a production of heat and every decomposition by a disappearance of heat. The chemical formula for crystallizable sugar is $C_{12}\ H_{22}\ O_{11}$. When sugar is burnt a complex chemical action takes place, the sugar is first decomposed into Carbon, Hydrogen and Oxygen, causing a disappearance of heat. The quantity so lost, I have not been able to ascertain, but it will do for all practical purposes, to assume it to be equal to and neutralized by the heat produced by the combination of the hydrogen and oxygen to form water. This water must be evaporated.

Rankine gives the following regarding the effect of oxygen and hydrogen upon fuel. "The quantity of oxygen and hydrogen are to be left out of account, in determining the heat generated by the combustion of the fuel. If the quantity of water actually or *virtually* present in each pound of fuel is so great, as to make its latent heat of evaporation worth considering, that heat is to be deducted from the total heat of combustion of the fuel." Assuming that 1200 heat units are necessary to raise one pound of water from 86° Fahr, and evaporate it at 572°, the temperature of the products of combustion required

to insure good chimney draught, we have for 100 lbs. of sugar containing 42·1 lb of carbon and 57·9 lbs of water :—

$$42{\cdot}1 \times 14{,}500 \text{ H.U.} = 610{,}450 \text{ H.U. minus}$$
$$57{\cdot}9 \times 1{,}200 = 69{,}480 \text{ ,,}$$

Remains 540,970 H.U. available in 100 lbs. of sugar. 540,970 ÷ 14,500 = 37·3 o/o of available carbon in sugar. It will be noticed that the total heat of combustion of 1 lb. of carbon is taken as 14,500 H.U. This is the result arrived at by MM. Favre and Siltermann. Rankine has adopted it in his caculations and gives as his reason for doing so : 1st. "The great delicacy and precision of the instruments and processes by which this result was obtained"; and 2nd. "Because amongst a number of different results as to the total heat of combustion, the highest is on the whole the most likely to be correct, most of the errors being caused by losses of heat. Dulong's result is 12,906 H.U., and Despretz's 14,040 H.U

In order to be able better to compare the compositions of megass, obtained with different percentages of crushing, the accompanying table * was prepared. The average of the analyses of the canes of different estates given in table A. of Mr. Russell's paper is taken as the compositions of the sugar-cane.

The carbon in the fibre is assumed to be equal to 50 o/o of the fibre and the available carbon of sugar to 37·3 o/o of the weight of the sugar.

The figures opposite the heading temperature indicate the elevation of the temperature of the products of combustion and the air with which they are mixed, at the instant that the combustion is complete above the temperature at which the air and fuel are supplied to the furnace. With fuels containing an excess of water, these temperatures can never be obtained, for the reason, that we cannot get the fuel to burn and consequently combustion cannot be completed. They are introduced in the table for the sake of comparison and are used to obtain the co-efficients of evaporation, as shall be explained afterwards. In comparing different kinds of coal, correct results may be obtained by taking the total heat of combustion of their elements in units of heat, but when coal is to be compared with green megass, a fuel containing a large percentage of moisture, the results, so arrived at, are simply misleading. The proof hereof lies at hand. Compare the amount of

* See page 173.

carbon present in the cane with the carbon present in coal and as Mr. Russell states, it ought to evaporate almost twice the water contained in the cane. But it is a known fact, that this is not the case, as the cane cannot be made to burn. The rate of combustion is greatly influenced by the presence of moisture in the fuel and consequently fuels containing largely differing quantities of moisture cannot be compared with each other, by taking their total heat of combustion in units of heat. The rate of combustion varies as some function of the moisture. This function may be determined, by making a series of experiments with megass, containing different quantities of moisture. Mr. Russell has found from his experiments with green megass, that 6·4 lbs. of water are evaporated by 1 lb. of carbon, the crushing being 70 per cent., and the megass burnt in Coster's Furnace. By substituting 37·3 per cent. the available carbon in sugar for 42·1 in Mr. Russell's figures, 6·4 becomes 6·5 lbs. of water evaporated per pound of carbon. Let us call this quantity the co-efficient of evaporation of 70 per cent. crushing megass. The co-efficients for the different kinds of megass can be obtained by making them proportional to the temperature of their products of combustion. It is not intended to convey the impression that these co-efficients are the actual figures. To obtain these would necessitate a series of carefully made experiments ; besides they would vary for different furnaces, but as they appear to approach very nearly the conditions of practice, they have been used in the discussion of the value of the different kinds of megass as fuel. By deducting the amount of water contained in any megass from the product of this co-efficient and the available carbon in the megass, we obtain the quantity of feed water, which can be evaporated by the megass.

After having explained the figures found in the table, we shall now proceed to their discussion. An examination of these figures will show that as the crushing is improved, the quantity of the water in the megass diminishes in more and more rapid ratio. The fibre increases in the same ratio as the water decreases and there is no doubt, but what the great increase of power necessary to improve the crushing bears some ratio to the fibre present in the megass. By comparing megass of 65, 70 or 75 o/o crushing with logie-dried megass, it will be seen that there cannot possibly be any saving of fuel by burning green megass. The megass, after being logie-dried has lost its sugar by decomposition, but the water lost by evaporation, more than makes up for this loss of sugar, as we shall see presently :—100 lbs. of 65 o/o crushing=44·5 lbs.

	100 lbs. of Canes contain	100 lbs. Megass contain with crushing of 10 o/o	20 o/o	30 o/o	40 o/o	50 o/o	55 o/o	60 o/o	65 o/o	70 o/o	75 o/o	80 o/o	100 lbs. of Logie dried Megass contain	REMARKS.
Fibre	12·65	14·05	15·81	18·07	21·08	25·30	28.11	31.62	36·14	42·17	50·60	63·25	81·14	
Sugar	14.70	14·48	14·18	13·80	13·30	12·60	12·09	11·55	10·75	9·80	8·31	6·30	—	
Water	72·65	71·47	70·01	68·13	65·62	62·10	59·80	56·83	53·11	48·03	41·09	30·45	18·86	
Carbon in Fibre ...	6·32	7·02	7·90	9·03	10·54	12·65	14·05	15·81	18.07	21·08	25·30	31·62	40·57	
Available do. in Sugar	5·48	5·40	5·29	5.15	4·96	4·70	4.51	4·31	4·01	3·66	3·10	2·34	—	37·3 o/o of weight of Sugar.
Total available Carbon	11·80	12·42	13·19	14·18	15·50	17·35	18·56	20·12	22·08	24·74	28·40	33·96	40·57	
Temperature	1195°	1275°	1370°	1474°	1586°	1718°	1794°	1872°	1957°	2048°	2144°	2251°	2346°	Fahrenheit.
Coeff. of Evaporation	3·8	4.1	4·4	4.6	5·	5·4	5·7	5·9	6·2	6.5	6·8	7·1	7·4	
Feedwater ev. ℔ 100 lbs.	—29	—21	—12	—3	12	32	46	61	84	113	152	211	281	

of logie-dried megass. Sugar decomposed 10·8 lbs. = 4 lbs. of carbon

Water evaporated	44·7 lbs.	
4 lbs. carbon × 6·2 =	24·8 lbs. water	which could have been evaporated by the sugar.—
	19·9 lbs. excess of water evaporated in the	

logie. Logie-dried megass is here assumed to contain 18·86 o/o of water. By taking 6·5 and 6·8 as the co-efficients of evaporation of 70 and 75 o/o crushing megass respectively, we find by a similar calculation that an excess of 14·4 lbs. of water for 70 o/o crushing megass and 9·1 lbs. of water for 75 o/o crushing is evaporated by drying 100 lbs. of the megass in the logie. It can thus be concluded that there is always some waste of fuel, however well the megass may be crushed. Some may argue, that the co-efficient of evaporation of the carbon is taken at too low a figure and that therefore the waste appears greater than it really is, but it is found that these figures very nearly approach the result obtained in practice. Even if we were to assume that 1 lb. of carbon could evaporate 9 lbs. of water, about the best average result, that has been obtained, with good fuel, there would be an excess of water evaporated in the logie of 8·7, 5·3 and 2·4 lbs. respectively for 100 lbs. of 65 o/o, 70 o/o and 75 o/o crushing megass. This is however contradicted by the deductions made by Mr. Russell from his experiments, and he claims 17 o/o in favour of the green megass. There is no doubt that these experiments were carefully made, but I cannot agree with Mr. Russell as regard his deductions. The 17 per cent. which he gives in favour of the green megass is not due to the value of this megass as fuel, but to the greater efficiency of Coster's Furnace compared to the furnace, in which the dried megass was burnt. A further examination of the results of the experiments with logie megass will show this. Here it has been found that 4·3 lbs. of water were evaporated to the pound of carbon. This is really a very poor performance and there is no doubt, that if this megass was burnt in the Coster's Furnace, an evaporation of 7-8 lbs. of water per pound of carbon would have been obtained. Mr. Russell would add a great deal to his already valuable experiments, were he to make a trial with logie dried megass in the furnace used for the experiments with green megass. The furnace in which the dried-megass was burnt is of a very good type, compared to the furnaces mostly used for this purpose. Mr. Russell's figures also point out the great waste, accompanying the burning of dried-megass in the furnaces, which are generally in use. Let us now

see what the waste of fuel amounts to in pounds of coal per ton of sugar by burning green megass. 100 lbs. of canes, with an extraction of 70 o/o, yield 70 lbs of Juice. 70 lbs. juice, $=6{\cdot}6$ gallons $\times$ 1.6 lbs. of sugar per gallon $= 10{\cdot}5$ lbs. of sugar. 70 o/o of $10{\cdot}5 = 7{\cdot}3$ lbs. of sugar obtained from 100 lbs of canes. $\frac{2240}{7\cdot3} \times 100 = 30695$ lbs. of canes required to make one ton of sugar. 30695 lbs. of canes give $9208{\cdot}5$ lbs. of megass and as we have seen before, 100 lbs. of megass of 70 o/o crushing, when dried in the logie, loses $14{\cdot}4$ lbs. of water more, than would have been evaporated by the decomposed sugar, if the megass was burnt in its green state. $9208{\cdot}5 \times \frac{14\cdot4}{100} = 1326$ lbs. of water. $\frac{1326}{6}$ $= 221$ lbs. of coal lost per ton of sugar, by burning the megass, as it leaves the mill. 6 lbs. of water per pound of coal is about the average duty of boilers in this colony. This low figure is chiefly due to the unskilled attendants we are obliged to employ. For 75 o/o crushing we obtain from 100 lbs. canes 7 galls. of juice $\times 1{\cdot}6 = 11{\cdot}2$ lbs. of sugar. 70 o/o of $11{\cdot}2 = 7{\cdot}8$. $\frac{2240}{7\cdot8} \times 100 = 28718$ lbs. of cane necessary to make one ton of sugar. $28718 \times 0{\cdot}25 = 7180$ lbs. of megass, giving a loss of $7180 \times \frac{91}{100} = 653$ lbs. of water. $\times \frac{653}{6} = 109$ lbs. of coal lost per ton of sugar. In a similar way, we find that the loss of coal per ton of sugar when the crushing is 65 o/o amounts to 382 lbs. In these examples it is assumed that the sugar obtained from the juice equals 70 o/o of the indicated sugar. When the manufacture is better than that, the waste of coal is of course less. The last line of the table gives the number of pounds of feed-water, which can be evaporated by 100 lbs. of megass. From this it will be seen, that a given weight of 70 o/o crushing megass can evaporate almost twice the feed-water, that can be evaporated by the same weight of 60 o/o crushing megass, also that 100 lbs. of megass of 30 o/o crushing contain three pounds of water more than can be evaporated by the carbon present in the megass. The figures preceded by the minus sign indicate the excess of water in the megass over that, wbich can be evaporated by the available carbon. When the crushing is 60 o/o, the amount of feed-water evaporated becomes very small and the megass does not burn well. When it falls much below 60 o/o, the megass simply smoulders and the fire finally goes out.

In order to make some of the foregoing appear more comprehensively, the following synopsis is given.

The useful carbon available in sugar equals about $37{\cdot}3$ o/o of the weight of the sugar.

It is wrong to compare green megass with coal, by taking the total

heat of combustion of the elements. There is always a waste of fuel by turning green megass. This waste amounts to about two cwts. of coal per ton of sugar, with a crushing of 70 o/o. It diminishes as the crushing is improved and becomes 1 cwt. for 75 o/o crushing, but it increases rapidly, when the crushing falls below 70 o/o.

The present way of burning dried megass is most wasteful. Let us now see if there is any saving.

We shall take an estate making a crop of 2000 tons of sugar, and having works capable of turning out about 100 tons per week. Such an estate would require about 600 ft. of Logies @ \$17 per ft. =\$10,200.

Int. on Capital @ 6 o/o ℔ an. Wear and tear of Logies @ 4 o/o Insurance „ 6 o/o	16 o/o of \$10,200 =	\$1,632
Megass carriers for 2000 tons of sugar at 50c. per ton		1,000
		\$2,632

$\frac{2632}{2000}$ = \$1.31 saved per ton of sugar by burning green megass. This in coal equals 419 lbs., coal being taken at \$7 per ton landed on the estate. From this has to be deducted the waste in fuel, which is 221 lbs. of coals for megass of 70 o/o crushing. This leaves a saving of 271 lbs. or \$0 84 per ton of sugar. When the crushing is 75 o/o, the saving amounts to \$0 97 per ton of sugar. With 65 o/o crushing the saving amounts only to about \$0 11 per ton of sugar. This is but a nominal figure. To burn green megass of less than 65 per cent crushing would be to incur a loss of money, while the gain shall increase rapidly as the crushing is improved.

There are several advantages accompanying the burning of green megass. The labour, which would be required to transport the megass from the logies can be used in the field during the grinding, when labour is in greatest demand. This is very important, especially in this colony, where labour is scarce and the immigration expenses high. A large reduction of insurance on estate's property other than logies. Machinery and buildings which are free from danger of fire, are at present insured, owing to the fact that most Insurance Companies refuse to accept the risk of megass logies, unless their value amounts to about 10 per cent of the value of other insured property.

Immunity from fire in the logies and consequent loss of fuel and delay of manufacture. Independence of the state of the weather, the megass in the logies not being fit to burn, when it has being raining

heavily and the grinding has been very long. The burning of green megass has now been considered both from a theoretical and financial point of view. The wonderful saving claimed by some, when burning green megass, has been pretty well disproved. Some have advanced the theory that the water of the megass is decomposed and burned as oxy-hydrogen gas, thereby saving a large amount of fuel. The absurdity of this theory becomes apparent, as soon as the very high temperature necessary to decompose water into its elements, is taken into consideration. Others assert that in some of the West India Islands sugar is manufactured without any fuel, except the megass burnt in its green state. This cannot be possible, if the cane juice contains an average of 1.6 lbs. of sugar per gallon, as in this colony. If the cane is badly crushed, it is true that there is less power required, but then the value of the megass as fuel, would be so much reduced as to require a corresponding increase of fuel when it is burnt green.

Mr. Russell rightly remarked in his paper, that he has "set the ball a-rolling." I have attempted to give it a feeble kick; may the impulse thus imparted to it, be of some assistance in reducing the cost of Manufacture of our Great Staple "Sugar."

Discussion on Mr. Coster's Paper.—Mr. Neville Lubbock mentioned that when he passed Trinidad, the manager of the Colonial Company's usine in that island showed him a statement of the work done, and it appeared that the consumption of coals, used along with wet megass as it came from the mill and crushed at 64, a lower pressure than was general here, was only 12 cwt. to the ton of sugar produced; and there was no doubt that in Martinique where the usines took the megass direct from the mill, the consumption of fuel was considerably less than it was in this colony. He thought that before long, the consumption of wet megass would be very general in this colony; the risk of fire would be very much lessened, and also the expenses of the labourers. The Colonial Company's experience certainly was, that in Trinidad they burned less coals to the ton of sugar than they were doing, with the use of dried megass in this colony. In Mr. Russell's paper he noticed that fibre and ash had been joined together; and he should very much like to ask what proportion of that was woody fibre. Mr. Russell had spoken of him (Mr. Lubbock) having in a paper in the *Sugar Cane*, misplaced the decimal points, which materially altered the finding. Mr. Russell said he was so staggered with the finding arrived at that he proceeded to verify calculations: but while verifying the calculations

Mr. Russell did not verify the data ; if he had taken the data and worked it out on his own calculation, it would have given a result more favourable even than that of his (Mr. Lubbock's.)

Mr. Coster stated that two of the reasons for the low consumption of fuel in Trinidad were, the canes contained more woody fibre, and the pressure in crushing was less.

The President said that the result of the crushing of 3,700 tons of sugar at *Vryheid's Lust* last year showed that the consumption of fuel had been 7 cwts. of coals to 1 ton and 21 lbs. of sugar; and these figures might be verified by any member who chose to do so. That result had been obtained by the burning of a large amount of megass, dried and wet together.

Mr. Coster pointed out that there was no rum manufactured at *Vryheid's Lust*, and it took 8 cwt. of coal to produce a puncheon of rum. He asked whether there was any rum manufactured at the Colonial Company's usine in Trinidad.

Mr. Lubbock replied in the negative.

Mr. McCalman, referring to the remarks made by Mr. Lubbock as to the consumption of coal at the Colonial Company's usine in Trinidad, mentioned that there had been a great deal of rain in Trinidad for three months before they reached that island, and the canes there were only at their best in March or April, and Mr. Abel had been put to disadvantage through repairs, &c., going on, and consequently the full works not in operation, but that gentleman stated he expected to give returns showing the consumption of coals at 6 or 7 cwt. per ton of sugar, before the end of April.

Mr. Lubbock said the results were far better in Martinique.

The President mentioned that at the factory of *Vryheid's Lust* they did not make a chemical sugar, and perhaps it was hardly fair to compare the consumption of fuel there to that at places where a high polarising sugar was made.

Mr. Lubbock did not think the difference in quality would make any difference in the consumption of fuel.

Mr. Nind mentioned, with reference to *Vryheid's Lust* that in making sugar for London lately, that factory used something like 1800 gallons, and the consumption of coals had been 5 cwt. according to the weather and the state of the megass up to 10 cwt. ; the lowest number of gallons last year was 1,210 for a ton of sugar, and the average was 1,556, he thought, for the year. But what had been done at *Vryheid's*

Lust had been excelled at *Providence*, Berbice: he had seen the books of that estate, and they were something so extraordinary that it would be a good thing if Dr. Henery could be induced to allow his figures to be published. The gallons on that estate were very high; there were 3,000 to a hogshead, of less than a ton, and there appeared to be some relation between the quantity of fuel consumed and the number of gallons used.

The President thought this subject should be referred to next meeting of the Society. The paper that had been read by Mr. Coster was a very excellent and valuable paper, and it was well that members should have a little time to think over it. Of course it was not desirable that discussions should be allowed to lie over from meeting to meeting, because it might exclude papers of equal value, but he thought this was a matter of importance to the colony generally, especially to the planters, and it would be well that this paper should be again discussed at the next meeting, when it should be understood the discussion would finish. The postponement would also allow Mr. Russell an opportunity of saying anything he might wish on Mr. Coster's paper. He therefore moved that Mr. Coster's paper be printed and brought up for discussion at next general meeting.

Mr. Kelly seconded the motion which was unanimously adopted.

After a few remarks had been made by Mr. Coster, about the consumption of fuel at *Providence*, the meeting was adjourned.

Meeting held 13th March, 1884.—The Hon. B. Howell Jones, President, in the chair.

Elections.—*Member*: George Smith.

Associates: P. A. Matthews; J. W. V. Stevens.

The Biennial Exhibition.—In accordance with a motion, notice of which was given by the President at the previous meeting, it was determined to postpone the Biennial Exhibition which in the ordinary course of

events would have been held this year, to 1885, provided that the Governor and Court of Policy gave their sanction to the postponement.

The Forestry Exhibition.—The Honorary Secretary read a letter from the Hon. W. Russell, thanking the Society for the honor they had done him by electing him to represent it at the forthcoming Forestry Exhibition at Edinburgh.

Mauritius and Indian Sugar.—The Hon. Secretary read the following letter dated 15th January, from Mr. Kirke, Acting Emigration Agent for the Colony, at Calcutta :—

I have the honour to forward to you, per ship *The Bruce*, which sailed for Demerara this morning, a box containing 21 samples of the Mauritius sugars exhibited in the Calcutta Exhibition, which I have obtained through the courtesy of Mr. Desplissis, the agent in charge of the Mauritius court. I thought that those sugars which obtain the highest prices in the Indian and Australian markets, would prove of interest to the members of the Royal Agricultural and Commercial Society. I have also forwarded in *The Bruce*, in care of Dr. Ireland, a small box containing samples of Indian sugar manufactured by Carew's Co. at their Rosa sugar mill in the North-West Provinces, as I thought it might be interesting to the Society to see what is done in India in the way of sugar manufacture. These sugars of Messrs. Carew and Co. are all made from sugar canes. I enclose a descriptive list of the samples. A catalogue of the Mauritius sugar is in the same box as the sample.

The President said these samples would be very interesting and he thought when they arrived the thanks of the Society should be conveyed to Mr. Kirke for his attention.

The Hon. Secretary said he had already written to Mr. Kirke, conveying the best thanks of the Society, feeling sure the Society would endorse his action. (Hear, hear.)

Notice of Motion.—The President gave notice that at the next meeting of the Society he proposed to make a communication on the Berbice River with some analyses of its soils.

"*Finds*" *of Indian Pottery on the East Coast Demerara.*—The President laid on the table some pieces of very interesting pottery. Some three or four months ago, when the manager of *Enmore* was extending the cultivation of that estate, he came across a shell-reef containing human remains and pottery of various descriptions; and the other day, in taking in a piece of new land at *Cane Grove*, Mahaica Creek, the manager found the pottery he (Mr. Jones) now placed on the table. It was very curious, because it was the first ornamented pottery, he believed, which had been discovered here. Mr. im Thurn, who dug up a great nnmber of the remains at *Enmore*, had stated that the pottery was of a higher type than any previously known from this colony, and was in fact not far below that from Peru. In examining the place, they found the pottery in small pieces, but very highly ornamented, and here and there they discovered skeletons, which seemed to have been embedded in black earth and encased in pottery, as wherever they found a skeleton the earth was black, and numerous pieces of pottery were found. At *Cane Grove*, they had found a skeleton so well preserved that the hair still remained on the skull, but unfortunately, through some superstition of a black man the skeleton was broken up, and he (Mr. Jones) was thus unable to exhibit it to the members, as he otherwise would have done. Vessels of pottery resembling cups and pots were found near the human remains, and it seemed to him, that the

race of people—whoever they might be who were buried there—were buried in the belief that they would require water and food to assist them in their journey from earth to heaven, or whatever destination they were bound for, because, near each skeleton, were platters and vessels that would hold water. He would place on the table at next meeting some more pottery now belonging to Mr. im Thurn, who had promised to give him some rough notes on the specimens, and these he should read at next meeting. Pieces of the pottery had been photographed, and a paper on the subject would appear in the Society's Journal, *Timehri*, at some future day.

The Sugar Cane as Fuel.—The President said that at the last meeting the discussion on Mr. Coster's paper on "The Sugar Cane as Fuel" was postponed. The discussion on the subject was opened in a paper by Mr. Shields, in reply to which Mr. Russell prepared a paper. Mr. Coster also had read a paper on the subject, and he had now in his hand a paper which he had received from Mr. Shields in reply to the paper received by Mr. Russell. As Mr. Shields opened the discussion, it was only fair that he should close it; and he proposed to defer reading Mr. Shields' paper until the discussion on Mr. Coster's paper should be concluded. If any member had anything further to say on Mr. Coster's paper, the meeting would be glad to hear him.

The following paper on *The Theory of Burning Green Megass*, written by Mr. James H. Mann was distributed among the members present :—

The burning of green megass having made so great a stride within the last few months, and being likely to become generally adopted,

I venture to think the few remarks that follow will prove an assistance to some and of interest to all in the study of the subject.

Combustion seems on first thoughts most complex, but in fact is one of the simplest of chemical phenomena. Each element of a fuel combines in known proportions with oxygen during the process of burning or oxidation, so that the amount of oxygen (or air containing that oxygen) necessary for the complete combustion of a given weight of fuel is ascertainable, and from this is found the weight and volume of the products of combustion. The energy or "heat" evolved by such chemical combinations is also known, and is convertible into an equivalent of work, if, however, there be any circumstance, such as water in the fuel, that will detract from the usefulness of this heat, we have merely to calculate the amount of chemical energy expended in overcoming the adverse circumstances so as to be enabled to compare the effectiveness of good and bad fuels.

I will confine myself entirely to the effect moisture, in the fuel under consideration, has upon conbustion.

There are many ways in which the detrimental effect is made apparent, viz., upon the *draught*, and *temperature* of combustion, and the *number* of units or heat available for work.

The moisture has to be evaporated at the expense of a portion of the fuel, and heated still further to the temperature of the other products of combustion. In this form it occupies considerable space, and increases the volume of the gases to be carried off, consequently a greater draught is necessary to maintain an adequate influx of air through the fire bars, yet by increasing the draught the gases will part with less heat in transit. The obvious remedy for this is to have a larger chimney and an increased sectional area of all the flues, the draught being increased in *volume*, not *speed*.

A given weight of canes yields a certain weight of combustible matter, *plus* a variable weight of water, according to the quality of the crushing, so that when comparing the combustion of green with that of dry megass, we must consider the equivalent weight of the green megass to be that of the dry, *plus* the percentage of water contained, that is, 2 pounds of green megass containing 50 per cent. moisture, must be comparable with 1 pound of dry megass; the 2 pounds of green megass, however, carry only 1 pound of combustible matter, and a portion of it has to be appropriated to evaporate the pound of water, the actual temperature is, therefore, considerably below that

attainable from dry fuel, and the number of units of heat available are also less, as will be shown further on.

It is evident then, the effects of the draught on the heat, and of the heat on the draught, must be mutually detrimental; and considering also an estate has to consume at least 2 tons of green megass in the place of 1 ton of dried megass, modifications must be introduced in the shape and size of the furnace, the distribution of air, the area of the flues and the power of the chimney, that involve principles very different to those now in practice, and about which we probably know very little.

The presence of water, or its constituents, in fuel, promotes the formation of smoke, probably by mechanically sweeping along fine particles of carbon; the escape of smoke, so noticeable with the use of moist fuel, is therefore due to and indicative of imperfect combustion.

I will now endeavour, by means of certain figures, to place the matter in a more practical form; I am however, unfortunate in not having with me an analysis of megass, and am presuming the combustible elements of megass (inclusive of the sugar contained in solution before drying) are equivalent to those of wood, pound per pound; this I think will be quite near enough for the comparison to be made between more or less dried megass, and will actually be putting the megass on too favorable a footing as a fuel. I shall, therefore, substitute in the following quotations, etc., the word *megass* for *wood.*

In Rankine's "*Steam Engine*," page 280, I find 1 pound of dried megass requires 6 pounds of air to effect its complete cumbustion, and if the usual allowance be made for the dilution of the gaseous products, we have double or 12 pounds of air admitted for every pound of dry megass consumed. Now, let us suppose the products of combustion pass off at a temperature of 572°, the volume (page 286) will be 314 cubic feet; if, however, the megass had contained its equal weight of water, there would be 1 pound or about 50 cubic feet of gaseous steam to be got rid of besides, or 364 cubic feet. Thus we see the presence of this 1 pound of moisture would reduce the admission of air 16 per cent., or necessiate an enlargement of the flues to the same extent with a proportionate increase in the power of the chimney. This, I take it, would not adequately represent the extent of the evil, for with moisture in the fuel, combustion would not be so brisk, the temperature would be less, and the draught still further reduced.

In Clark's "*Manual of Rules, Tables and Data,*" page 405, the evaporative power of 1 pound of dry megass is given as 7 pounds of water; and if we suppose it capable of evaporating $\frac{2}{3}$ of 7, or $4\frac{2}{3}$ pounds in practice, what will be the effect of moisture if present to the extent of 50 per cent? To evaporate 1 pound of self-contained water the useful evaporation will be reduced from $4\frac{2}{3}$ to $3\frac{2}{3}$ pounds, or 22 per cent, and this when the combustion is presumed to be equally perfect in both cases, a very unlikely occurrence.

From the same authority, page 444, I find the total heat of combustion of dry megass is 7792 units, and in the manner shown, page 407, can calculate that 3·219 units of heat raise the total products of combustion 1°, from which their specific heat, 247 is found by dividing 3·219 by 13, the weight of the products; also by dividing 7·792 by 3·219=2·424°, we get the temperature of combustion. When 1 pound of water is associated with 1 pound of megass, 1·116 units (total heat of steam) are appropriated to evaporate the water, leaving 7·792—1·116=6·676 units of heat available for raising the temperature of the gases.

To raise the direct products 1° there are required	3·219 units.
And to raise the water (as gaseous steam) 1°	·475 units.
Total to raise mixed products 1°	3·694 units.

Then the units of heat available divided by this, that is 6·676÷3·694=1·807°, gives the temperature of combustion of megass holding 50 per cent. moisture, which is only 74 per cent. of 2·424°, that of dry megass.

Now let us study the *total* units of heat with those *effective* after deducting the loss due to the escape of the gases, at some 500° above the normal temperature. As before, 1 pound of dry megass yields 7·792 units, but, as it requires 3·219 units to raise the products of combustion 1°, there are lost 500 × 3·219=1·609 units, leaving 7·792—1·609=6·183 units as effective. Now, with the 2 pound sample of megass containing 50 per cent. moisture, we have already seen there are but 6·676 of heat available, and 3·694 units are required to raise its mixed products 1°, consequently there are lost 500 × 3·694=1·847 units, leaving 6·676 – 1·847=4·829 units as effective. So here again, we see the effectiveness is reduced to 78 per cent. of that of dry megass.

From this it would appear that megass holding 50 per cent. moisture (about the best result obtained from the heaviest mills) should theoretically burn, in its green state, with but a loss of 22 per cent. of its evaporative power; but in practice, such a favorable result can not

possibly be attainable, owing to the combustion being imperfect and less rapid, neither can we hope to approach this degree of perfection until the necessary modifications, in the means employed, have been arrived at and introduced.

In the United States and some of the West India Islands, the Jarvis patent furnace for burning green megass, is reported to be in successful operation; hot air is introduced upon the fuel, and although theoretically it can only impart as many units of heat as it receives from some other source, the idea presents two indirect methods for promoting combustion. The drying process is probably effected by the heat in the air, and, the moisture being disposed of more rapidly, the units of heat, due to combustion, are available for useful work; then a forced draught is known to increase the rapidity of combustion, besides enabling perfect combustion to take place with less air, that is, a lesser percentage of additional air being required for the dilution of the products of combustion, the products are less, the loss due to the escaping gases less, and the temperature of combustion more.

I give below, in a tabular form,* a recapitulation of the above results, with the addition of two other examples, calculations for which are suppressed. One is for megass holding 66·6 per cent, its weight of moisture (as represented by 55 per cent, expression from canes carrying 15 per cent. woody fibre), it presents a sorry comparison, but is, I fear, too often the case with inferior crushing. The other is for megass containing 25 per cent. moisture, a result that could only be obtained by very heavy crushing and perfect feeding; and, as this touches upon another subject of great interest to me, I will dismiss it with the hope and belief it will be an accomplished fact before very long. It is my opinion, improvements in single crushing should be aimed at by every one of us, as in this direction alone can we expect the burning of green megass to become more and more economical, and in time a great success.

* See page 187.

Comparative Table.

Equivalent Weights of Megass.	Combustion Matter—Approx.	Water. Weight.	Water. Percentages.	Water. Useful Evap. In lbs.	Water. Useful Evap. In Percentage.	Air admitted.	Products of Combustion. Weight.	Products of Combustion. Volume at 572°	Products of Combustion. In Percentages.	Products of Combustion. Mean Specific heat.	Products of Combustion. Unites of heat to raise temp. 1°	Temperature of Waste Products above Normal.	Units of Heat. Total.	Units of Heat. Wasted.	Units of Heat. Effective	Units of Heat. In Percentages.	Temperature of Combustion	In Percentages.
1 lb. dry ...	1 lb.	...	...	$4\frac{2}{3}$	100	12 lb.	13 lb.	314 cub. ft.	100	·247	3·219	500°	7792	1609	6183	100	2424°	100
$1\frac{1}{3}$ lb. green...	1 lb.	$\frac{1}{3}$ b.	25	$4\frac{1}{3}$	92	12 lb.	$13\frac{1}{3}$ lb.	331 cub. ft.	105	·253	3·377	500°	7420	1688	5732	92	2197°	90
2 lb. green...	1 lb.	1 lb.	50	$3\frac{2}{3}$	78	12 lb.	14 lb.	364 cub. ft.	116	·264	3·694	500°	6676	1847	4829	78	1807°	74
3 lb. green...	1 lb.	2 lb.	66·6	$2\frac{2}{3}$	57	12 lb.	15 lb.	414 cub. ft.	132	·278	4·169	500°	5560	2084	3476	56	1333°	55

JAMES H. MANN.

Denver, Colorado, U.S.A., Decr. 27th, 1883.

The Hon. W. Russell recognized the value of the paper as far as theory was concerned; but regretted the absence of practical results. There was one point in regard to which he must join issue with Mr. Mann. Mr. Mann said :—

The presence of water, or its constituents, in fuel, promotes the formation of smoke, probably by mechanically sweeping along fine particles of carbon. The escape of smoke, so noticeable with the use of moist fuel, is therefore due to and indicative of imperfect combustion.

But anyone who had observed the chimney at *Bel Air* since that estate began to burn green megass must have noticed that there had been comparatively little smoke, and that what there had been had been so intermixed with, and purified by steam, that it had been of a white colour, not black as before. His idea of smoke was that it was composed of fine particles of carbon, enveloped in an atmosphere of carbonic acid gas, which particles were not consumed until they came in contact with the atmosphere. Everyone who had watched a chimney at night must have been struck by the flame emitted. That flame was due to the re-kindling of the carbonic particles contained in the smoke, and was not visible by day. Turning to Mr. Coster's paper, the honourable gentleman said that that writer had dealt very fully with the units of heat, and bore out a great deal of what had been written before. But he did not give them the results of actual experience. If he had said that in his furnaces at *Anna Regina*, or elsewhere, he had burnt so much green megass and had got that megass to do a certain quantity of work, Mr. Coster's recent paper would have been a very valuable one. He was glad to hear that Mr. Shields had sent in another paper, because he knew it would be brimful of hard stubborn

facts,—would contain actual practical results, not theory. What he (Mr. R.) maintained in his original paper, and what he held now, that it was essential to the successful burning of green megass that the water should be to a certain extent eliminated from it. Nothing in either Mr. Mann's or Mr. Coster's paper altered his opinion. As fuel there was nothing equal to dry megass, even allowing for the cost of logies. He hoped that in a future paper on the subject Mr. Coster would furnish them with actual results in the saving of coal. He had been surprised to observe on estates where they professed to burn green megass the extent to which they very frequently mixed coal and dry megass with it. He did not wish it to be thought that he was inimical to the burning of green megass. He was still at work upon it, and should be happy to give the result of his experiments at some future meeting of the Society.

Mr. Coster said the object of his paper was not to shew that there was any saving of fuel in burning green megass. Both Mr. Lubbock and Mr. Russell thought there was a saving; but he believed there was always a waste of fuel in burning green megass. At one time he thought there was a saving, but he was now convinced there was not.

Mr. Blake said he had paid a visit to the Central Factory at Surinam, and found they were burning green megass to work the second mill. For the last six months the consumption of coal to the ton of sugar had been only 5 cwt.

Mr. Russell inquired what the pressure was.

Mr. Blake said the expression of juice was from 72 to 76 per cent.; the average would be about 74.

Mr. Russell asked if they made any rum.

Mr. Blake said they made 15 gallons of rum to the ton of sugar, and the rum was included in the calculations he had given.

Mr. Russell said that what had fallen from Mr. Blake entirely confirmed what he had laid down in his paper, *viz.*, that with an expression of anything above 70 per cent. of juice it would be advisable to burn green megass; but with anything below 70 it would be a positive waste of fuel. He was glad to hear they were doing so well at the Central Factory, as to be able to make a ton of sugar with only 5 cwt. coal. But, of course, they did not know the consistency of the canes,—how much was woody fibre, or what amount of sugar it contained; and those were very important elements in the calculation.

Mr. Shields' paper, closing the discussion, was to the following effect:—

In the paper which Mr. Russell laid before your meeting of the 10th January, he criticises my remarks made at a former meeting, I think rather unjustly. While I do not in any way object to criticism, it is but fair to ask that the person who takes that in hand should carefully read and justly interpret the remarks made in the paper he attempts to criticise. If Mr. Russell will do this, he will find that I never said that cylinder enlargement alone is the one thing necessary, "that I do not make a mistake," and assume that a certain percentage recovered was all gain from an *l.s.d.* point of view.

Strange as it may seem, Mr. Russell also accuses himself unjustly. If he will turn up the passage referred to in "Sugar growing and Refining," he will see that he did not make the mistake he takes credit for. Instead of over-estimating, I find from the table by J. Owen Alexander that I have under-estimated the loss due to the imperfect crushing by 100 per cent. In my paper I assumed that 63 per cent was the average crushing and that it was possible to obtain 70 per cent. Mr. Alexander shows that 77·07 per cent is actually obtained from the canes at *Providence*,

Why should this not be obtained all round? If we assume 77 instead of 70 per cent as the amount of juice obtainable from the canes, it brings up the loss through crushing of the colony crop of 130,000 tons, to the sum of $2,000,000, *and this after deducting the cost of manufacture.*

Mr. Russell also joins issue with me on the question of double *versus* single crushing, and to illustrate his views he compares the cane to a bloom taken from the iron worker's furnace which requires shaping down. I do not think he could have chosen a more unfortunate illustration for himself. The iron-worker with his bloom must keep several definite results in view from the moment he takes his iron from the furnace; he must work it not only to express all the slag and other impurities, but to arrange the fibres all in a proper direction, having in view all the time the shape which his bloom must assume in passing to the finished bar. With the cane we have only the idea, to crush the juice out of it, and Mr. Russell has failed to prove theoretically or practically, that this cannot be done as well at one operation as at two. At his own estate of *La Bonne Intention,* where double crushing and maceration has long been practised, and where perfection in crushing may be looked for if it is to be looked for anywhere, he manages to get the insignificant result of 66·25 per cent of the weight of the canes, while at the neighbouring estates of *Success, Le Resouvenir* and *Vryheid's Lust*, where only single crushing is practised, very much better results are obtained. I will not attempt anything like a review of the staggering array of figures which Mr. Russell presents us with in his very valuable paper, but would like to say a word or two on the part of it which treats on the subject "Sugar cane as a fuel." This is a subject that must have occupied the minds of intelligent planters from a very early period, and year after year it has been forcing itself to the front. The present attempt of Mr. Russell to place the subject on a thoroughly scientific basis is worthy of all praise, and will, it is to be hoped, end in clearing away some of the mist and fallacies which surround it, and although the conclusions arrived at are not very different from those come to by some of us who have only used the rule of thumb mode of studying the connection between cause and effect, yet the experiments which for the most part have been most admirably conducted show the absurdity of the attempts which have lately been made to effect a saving in fuel by burning wet megass rather than dry.

I believe that on a former occasion Mr. Russell undertook to prove that water would not run up-hill, and although the demonstration cost

a good round sum of money, I have heard that it was very unsuccessful, for after everything possible had been done to make the water ascend, "the thrawn thing wad gang its ain way." Very much the same thing has been done in the present instance. Many attempts have been made, and at considerable expense to extract from wet fuel what is really not there. The paper before us shows conclusively that the value of megass as a fuel is very nearly in proportion to its dryness, and that any attempts that have as yet been made to make it yield fire from the water contained in it must necessarily result in failure.

Besides the truths so clearly enunciated in the paper, there is one of not less importance which seems to have been omitted. It is this; fuel consumed at a low temperature will not communicate the same amount to a steam boiler as if the same fuel had been consumed at a high temperature. Professor Rankin puts it thus, "when the difference between the heat of the gases and the water to be evaporated is very great, the rate of conduction increases faster than the simple ratio of that difference and is nearly proportional to the square of the difference of temperature." If inventors had been aware of this law, or if they had kept it steadily in view, it might have kept them from deluding their customers by promising reductions in fuel varying from 15 to 60 per cent. To illustrate how this law operates, let us assume that the gases given off from a furnace where wet megass is used as fuel reach the boiler at a temperature of 1300 degrees Fah., although I doubt very much if they are ever so high, while those from a furnace where dry fuel is used are 1800 degrees; they are often more than this. The temperature of the water in the boiler is in both cases 300 degrees Fah.; the rate of conduction in the one case is then to the rate of conduction in the other as $(1300^\circ = 300^\circ)$ $(1800^\circ = 300^\circ)$, or as 1 : 2·25. Thus it will be seen that however much you may increase the volume of heated gases by increasing the size of furnace and grate area, unless you can at the same time increase their temperature, very little more heat will be communicated to the water in the boiler. The capacity of water vapor for heat is so great that it is impossible by any of the methods yet proposed to obtain a high temperature from a fuel which contains two-thirds of its weight of water.

The history of wet megass furnaces is very interesting and rather curious. My attention was first directed to the subject in 1880, by the report of an eminent planter who went to Martinique to report on the Marie Furnace at work there. In that report he says, "with regard to

the saving of coal, I went fully over the books of Point St. Simon and Marin, and at the former usine the books show from 50 to 60 per cent. of saving in coal by the day, but they were not made up for the whole crop; at the latter, the savings for the whole year was 40 per cent.? At Lamartin they say the saving is from 60 to 68 per cent., but as I did not see the books, I cannot put this as being correct. I am convinced, however, that a saving of 50 per cent. may be effected by adopting them."

This statement, staggering as it may appear, was the statement of a sane planter, who I believe had no intention to mislead or exaggerate, but who reported things exactly as he believed them to exist. Strange as it may seem, his report was received as gospel and acted upon by many, and Marie was proclaimed as the great prophet of economy in fuel; and planters fondly hoped that 50 per cent. of the money they were now spending on coal would go to increase the profit of the trade. How have these hopes never been realised, or if they have in only very small degree?

My impression, expressed at the time and confirmed since, is that the Marie furnace owes its fame to an accident—the accident of its happening to be connected with a loco- or semi-portable boiler. In a boiler of this type the fire-box is by far the best part of the heating surface. Stephenson says it is in proportion of 3 to 1 to any other part of the boiler. To fire such a boiler as this direct with such a fuel as megass would be to sacrifice almost the whole of the fire-box as a heating surface, owing to the cold air that would rush in along with the fuel, and for the same reason the temperature in the fire-box would never be sufficiently high to enable effective combustion to be carried on, and the temperature of the gases would be so low that they would be extinguished as soon as they entered the tubes, and pass to the chimney as smoke rather than flame. In such circumstances the adoption of any well-constructed furnace would no doubt effect a vast saving in fuel, but the saving is effected by adopting a good instead of a very bad mode of firing, and not by any charm in the furnace, and nothing can be more absurd than the idea that it is due to the consumption of wet rather than dry megass. The inventors of patent furnaces and their supporters often claim that those furnaces do very well when applied to a boiler, although they fail when applied to a copper wall. How is this? Is it not the effect of a faith which is the substance of things not seen, in the first case, while in the latter, they cannot shut their eyes to the fact

that the coppers don't boil worth a cent. In the first case the changing from ordinary to hard firing in the coal boilers may make up for the deficiency of the wet megass furnaces, but at the same time it may increase the consumption of coal from 30 to 50 per cent. while in the case of the copper-wall there is no substitute—hence the failure.

"Abolish the copper-wall," some people say, "and adopt the triple effet, and the wet megass furnace will be a complete success." The adoption of the triple-effet will certainly effect a great saving in fuel, but we do not admit that a single ounce of that saving will be due to the burning of wet fuel but if there is a saving with wet, the saving with dry fuel will be much greater.

From anything that I have said in the foregoing remarks, you are not to conclude that I consider the furnace of no importance. I have only tried to clear away the rubbish that we may have a sure foundation to build upon. With such a fuel as megass or indeed with any other kind of fuel, the construction of the furnace is of very great importance, both from an economical and a scientific point of view; and although the attempts to perfect that apparatus have not as yet been entirely successful, yet in the end they are bound to lead to important results. Not only is the construction of the furnace an important matter, but the construction of the boiler is in my opinion of not less importance, and I venture to question if we have yet got the proper type of either of them.

In the north of England where blast furnaces are at work, gases are much used for firing; the boilers are made very long, in some cases I believe over sixty feet; they are hung from the top, and the gases are allowed to play all over the underside up to the water line. Might not a boiler of this type suit our megass fuel, which like blast furnace gases, has the property of carrying flame to a very great distance. The old planters certainly knew the value of this property when they added one copper after another to the copper wall, and then placed a boiler behind all. If our copper walls are to be abolished we ought to take care that something equally well suited to the economical consumption of our megass fuel is put in their place. This leads me to consider the experiment mentioned by Mr. Russell, to determine the value of logie-dried megass, containing 18·86 per cent combined moisture, *versus* megass direct from the mill, containing 48·03 per cent. combined moisture, from which he concludes that the latter is 17 per cent more valuable as a fuel than the former. I am surprised that Mr. Russell as a practical man should pin his faith on a single experiment, and that

experiment of no value whatever in determining the point he seeks to determine. It reminds me of the question we used to put to one another at school, viz, "If a cart of coals costs seven-and-six-pence, what will a suit of black clothes come to?" Mr. Russell must surely know that some furnaces and boilers give very much better economical results than others. The experiment quoted above only proves what any one might have told him before hand, that the Coster furnace with 42 square feet grate area burning 49 lbs. megass per square foot per hour, would give more economical results than the old type of furnace with 25 square feet grate area, and consuming 57 lbs. megass per square foot per hour.

If Mr. Russell would reverse the experiment, I venture to predict that the results will be more than reversed, and that Coster's furnace fired with the logie megass will show that it is 30 per cent. more valuable as a fuel than the other. If Mr. Russell wants to test the value of different kinds of fuel he must use the same furnace and boiler, and see that the experiments are carried out under exactly the same circumstances, otherwise they are worse than useless; they are misleading. I might have shown from Mr. Russell's own figures that the results could not possibly be as made out by him, but when the experiment itself has been conducted on terms so obviously unfair, it would only be a waste of time to take any notice of them. It is not easy to see what Mr. Russell means when he talks about success or failure in the burning of green megass; if he means that it can't be consumed unless 70 per cent of juice has been expressed from it, we know from experience that he is wrong, for it can be consumed at any degree of dryness, from the canes upwards. If he means that in some circumstances green megass will give better results as a fuel than if it was dry, I can only say that this is entirely at variance with my own experience, and I believe also that it is contrary to the experience of those who have tried it most. If Mr. Russell could give us a single instance (well-authenticated) in which the attempt to burn green megass direct from the mill has not been attended with an *increase in the quantity of coals* necessary to produce a ton of sugar, it would be of more value than any amount of deductions drawn from a single experiment of three hours duration.

In measuring the success or failure of the operation another factor must be taken into our calculations; and we may put it thus. If the saving effected by the abolition of logies, insurance, watchmen, and

other labour connected with the drying of megass, is greater than the increased expenditure on fuel, boilers and stokers, then it may be looked upon as a success; otherwise, we are afraid that most people will be inclined to look upon it as a failure. In making the above statement I am not forgetful of the fact that in certain circumstances it may be advisable to spend more in saving labour than the mere money value of that labour, but these circumstances must be looked upon as accidental, and should not be taken into account in estimating the success or failure of the operation of burning megass direct from the mill.

Discussion.—Mr. Russell said he was exceedingly sorry Mr. Shields was not in the colony to take part in any discussion that might arise upon this paper; but every engineer in the colony would be pleased to learn that Mr. Shields did not hold that mere increase in the size of the cylinder was itself sufficient to give better results. With regard to what Mr. Shields said about single and double crushing, he (Mr. Russell) admitted that at *Diamond* they were doing better with single crushing than at *La Bonne Intention* with double crushing; but at *Providence* double crushing, with maceration, was a perfect success. He did not believe in single crushing, nor in crushing the dry megass a second time; with second crushing either boiling the megass or saturating it with steam was necessary. With regard to burning green megass he joined issue with Mr. Shields. He held that green megass could be burnt profitably if a certain amount of moisture was first taken out. He was not the man to continue burning green megass in Coster's furnace at *La Bonne Intention* if he was not satisfied with the results. They did better with green megass crushed to 72 or 73 per cent. than with dry megass from the logie. He preferred Coster's furnace to Marie's; feeding against the flame was one of its chief advantages, and it burnt the fuel thoroughly without having recourse to the opening of the furnace doors to stir up the fire. Furnaces for the burning of megass were as old as sugar-making; Pere le Batte, the old Jesuit priest, who invented the copper-wall, constructed one.

The President said that, with regard to the discussion which had just closed, he believed that the Society had arrived at the conclusion that the patentees of the furnaces for the burning of green megass did not claim any great saving of fuel from the use of their inventions. Another point they had arrived at was that unless certain percentage of crushing—placed by Mr. Russell at 70 per cent.—was attained in the

mills, to burn green megass involved a waste of fuel. Having arrived at these two results he thought the Society had gained a great deal, and they would be only doing right in tendering the thanks of the Society to the gentlemen who had prepared papers on the subject and to those who had assisted in the discussion. He hoped this would not be the last subject that would be threshed out in an equally thorough and efficient manner during his incumbency of the presidential chair.

The discussion then terminated.

The Hon. W. Russell then read some notes on '*Accidents due to sudden Vacuum.*'

Donations.—The following donations were announced and thanks were given to the donors :—

"The Colony of British Honduras; its Resources and Prospects", by D. Morris—presented by direction of the Governor.

"Cavaliers and Roundheads in Barbados", presented by N. Darnell Davis, Esq.

Hour of Meeting.—Attention was called to the fact that in future the hour of meeting would be at 3 p.m.

The meeting then terminated.

Meeting held 10th April.—The Hon. B. Howell Jones, President, in the chair.

Elections.—*Ordinary Members*: W. Ranken, D. Pentland, M.D.

Associates: G. A. Munro; J. Kemlo; J. A. K. Lennox; T. T. Smellie; A. E. Manning; W. A. Parker.

The Sugar Cane as Fuel.—The President said that there being several important subjects under the head of miscellaneous business, he proposed to postpone the reading of his paper till next meeting, He also stated

that since the closing of the discussion on burning green megass as fuel, he had received by last mail a very valuable paper from Mr. James H. Mann, Denver, Colorado, U.S.A. Considering that the paper was a very valuable document, he thought they might waive what was said about the closing of the discussion on this subject, and read this paper ; because, the writer was a distance off, and he could not possibly have sent his communication in time for the last meeting. The paper was then read :—

The Theory of burning Green Megass.

In my previous paper on this subject, I treated megass simply as a fuel containing more or less moisture, excusing myself on the ground of possessing no analysis, and having given deductions that are not strictly correct I trust I shall be blamed only for having been rather premature in stating my argument.

After a perusal of several very interesting papers by Mr. Russell and others, lately received from Demerara, I am enabled to gather the required information, and, by following up my object of obtaining a comparative statement of the megass as a fuel, shall show my original deductions were not so very far wrong after all.

Table " A" in one of Mr. Russell's letters, compiled with evident care and precision by Mr. Alexander, contains information most valuable and instructive. The percentage of available carbon in the megass is given, as well as the heat units in a pound of megass ; yet these figures give no real comparison between the different samples of megass, neither would the total carbon remaining in the megass from 100 cane represent its comparative value as a fuel, since there is a variable amount of moisture to be dispelled at the expense of some of this carbon.

In the upper portion of this table * I have taken an ideal cane carrying 13, 15 and 72 per cent., respectively, of fibre, sugar and water, and have compared the megass obtained from such cane after different percentages of juice have been extracted. The highest percentage of expression, viz: 87, is of course one never to be attained in practice, but is here worked out merely to find the maximum possible value of megass as a

* See page 199.

IDEAL CANE.				Perc'ntage of expression.		MEGASS.				CARBON.			WATER.		UNITS OF HEAT.				Relative value of Megass as a fuel.
Fibre, Etc.	Sugar.	Water.	Total.	On weight of canes.	On maximum possible.	Fibre, Etc.	Sugar.	Water.	Total.	In Fibre, Etc., at 50 per cent.	In Sugar at 42·1 per cent.	Total.	Of crystallization at 57·9 per cent.	Total.	In theory at 13000	In practice at 7280 or 56 per cent.	Appropriated by self-contained water at 1120.	Available for useful work.	
13	15	72	100	87	100	13	nil	nil	13	6·50	nil	6·50	nil	nil	84500	47320	nil	47320	100
				77	88·5	13	1·72	8·28	23	6·50	·72	7·22	1·00	9·28	93860	52561	10393	42168	89·1
				67	77·0	13	3·44	16·56	33	6·50	1·44	7·94	2·00	18·56	103220	57803	20786	37017	78·2
				57	65·5	13	5·17	24·83	43	6·50	2·17	8·67	3·00	27·83	112710	63117	31169	31938	67·5
"LEONORA" CANE.																			
Fibre alone..................				87·90	100	12·10	nil	nil	12·10	6·05	nil	6·05	nil	nil	78650	44044	nil	44044	100
Logie 18·86 per ct. water						12·10	nil	2·81	14·91	6·05	nil	6·05	nil	2·81	78650	44044	3150	40894	92·6
Green, equivalent to do.				82·00	93·3	12·10	·93	4·97	18·00	6·05	·39	6·44	·54	5·51	83720	46883	6172	40711	92·4
Example, Table "A"......				71·83	81·7	12·10	2·54	13·53	28·17	6·05	1·07	7·12	1·47	15·00	92560	51823	16800	35023	79·5

fuel, and with which the other samples can be correctly compared, the constituents of the megass are given in percentages of the original weight of canes, so that the *actual* amounts are carried right through, and I include the water of crystallization a no unimportant portion of the total self-contained water that appropriates so many units of heat, and detracts from the value of the megass as a useful agent. The number of units of heat per pound of carbon (13·009) is practically the same as that employed by Mr. Alexander, and the number convertible into work, in practice, I take at 56 per cent of the theoretical figure, because I find this to be a mean of a number of trials given in Clark's "Rules, Tables and Data."

There is a striking similarity between the percentage of expression upon the maximum possible and the relative value of the megass as a fuel, so much so that one might consider the value of megass obtained from such canes as proportionate to the percentage of expression; these figures, however, do not represent a correct comparison, except on the assumption that combustion is equally rapid and perfect in all cases, and as this can not be, I believe the megass from badly crushed canes is a far more inferior fuel than here represented. In other words, every step made toward heavier crushing and improved expression, will produce a fuel exceeding in relative value that given in the last column of the table.

Curiously enough, the megass from 67 per cent. expression carries 50 per cent. water, and its relative value as a fuel is 78, precisely the same figure as given in my previous paper for megass holding the same percentage of moisture.

Mr. Russell attributes to superior crushing the surplus of carbon and a diminution of water in "Leonora" megass as against "Rose Hall," how can any comparison be made when the canes are so dissimilar? The less a cane is crushed the *more* must be the water left in its megass, as well as *more* carbon, the excess of which (with ordinary good canes,) is theoretically equivalent to the evaporation of the excess of water, but as in practice only about 56 per cent. of the heat units are convertible into work, the excess of water predominates, and if "Leonora" canes had been ground at "Rose-Hall," the megass would have been inferior, although carrying more carbon, as distinctly illustrated by the above tables.

Then again from actual experiments made with green and logie megass, Mr. Russell arrives at certain conclusions which I propose to

show are altogether wrong; to begin with, he does not make a correct comparison between the fuels; a given weight of canes yields a certain percentage of green megass; which when dried in a logie loses all its sugar, (I presume,) and a large quantity of water, reducing its weight to about one-half, so it is this lesser weight of logie megass that has to be compared with the original weight of green megass; let us take Mr. Russell's examples thus:

	No. 1 Green.		No. 2 Logie.		
Fibre	42·95	remains	42·95	or	81·14 per cent.
Sugar	9·02		nil.		
Water	48·03	reduced to	10·18	or	18·86 per cent.
	100		53·13		100

Here we see the 100 green megass is reduced to 53·13 in the logie, and the experiments conducted at "Leonora" show that 100 lbs. logie megass evaporated 156 lbs. feed water, that is, every 53·13 lbs. would only evaporate 82·87 lbs. against 114 lbs. by its equivalent 100 lbs. green megass. *Mirabile dictu*, an evaporation of 37 per cent. in favor of the green megass! This to my mind is utterly preposterous, and compels me to be very sceptical as to the value of making such experiments; we are further told, 1 lb. of carbon in the green and logie megass evaporated 6·4 and 4·3 lbs. respectively; now, I appeal to common sense, how is it possible for a pound of carbon to do 49 per cent more work in one case than in the other! From being in contact with an excess of water one would naturally expect to find a decided inferiority, in this respect, with the use of green megass, and my calculations, given in the lower portion of the table, show the logie megass as superior to the green by 16 per cent.

In this table I have compared the resultants from "Leonora" cane, under different circumstances, in the same way as I treated the ideal cane. The first line gives the maximum possible fuel value of the fibre alone, and the last line the relative value of the megass from an expression of 71·83 per cent., then we have the logie megass carrying 18·86 per cent. water and a supposed example of green megass theoretically equivalent to the logie megass, which shows an expression of 82 per cent. is necessary for the production of a green megass equal in fuel value to logie megass. The practical question then comes in, at what lesser percentage of expression would it pay to burn the megass

green? At what point will the cost of the requisite additional coal be compensated for by the economic circumstances attending the use of green megass? Extra coal is required for supplying the deficiency of available heat units in the green megass, for producing the additional power absorbed by the canes in yielding a greater percentage of juice, and for concentrating the additional quantity of juice thus obtained. On the other hand we have value of additional products, no manipulation of the megass, no logies, less insurance, immunity from the detrimental effects of bad weather upon the megass, etc., each and all involving most intricate calculations that prohibit the possibility of defining the point of financial balance between the old and new systems. One thing is certain, the amount of coal burned per ton of sugar made must increase (without improved machinery), but when improvements in crushing have been carried far enough to ensure a financial success of the use of green megass, this will no longer be deplorable. Estates that can boast a percentage of expression well into the seventies have, probably, achieved the object in view, even if they are not saving money by it; but with others I am sure it must be otherwise.

I do not wish to discourage those who attempt to prove the present degree of crushing warrants the introduction of the new system, let everyone do his utmost to improve the crushing and burn green megass, it is by their losses we shall gain experience, and ultimately triumph in seeing fuel accounts within reasonable bounds, and cost of manufacture considerably reduced; the goal is within sight and we are moving in the right direction, let us therefore press forward with all possible speed.

JAMES H. MANN.

Denver, Colorado, U.S.A., February 26th, 1884.

The Campbell Memorial.—The Secretary read a letter from Mr. Walker forwarding a letter from Mr. H. H. Armstead, with respect to the probable cost of a bust of the late Mr. W. H. Campbell. Mr. Armstead stated, that his charge for an ordinary posthumous bust was two hundred guineas. In Mr. Walker's letter, that gentleman stated that he was making further enquiry as to the charges of other artists. It was decided to wait for further information from Mr. Walker on this matter.

Postponement of the Biennial Exhibition.—A letter from the Government Secretary dated 29th March, intimating that the Governor and Court of Policy had acceded to the proposal of postponing the biennial exhibition, which would, in the ordinary course of events be held this year, was taken for notification.

The Calcutta Exhibition.—A letter was received from Mr. Kirke, forwarding information for the Society with reference to the Calcutta Exhibition. He stated that a few awards have been published, and amongst others was, a first class certificate and silver medal to British Guiana, for "Bitters". He had also to state, that the following awards of the jurors at the Calcutta Exhibition had been published :—

1st class certificate and silver medals to the Exhibition Committee, British Guiana, A. C. Stenson, and Mrs. Carruthers, for West Indian Pickles.

2nd class certificate and bronze medal to the Exhibition Committee, for Guava Jelly.

4th class certificate to A. Stenson, for Guava Jelly.

1st class certificate and gold medal to the colony of British Guiana, for a collective exhibit of gums, white and coloured.

The awards of the jury on sugar had not yet been published. The President observed that we had maintained our reputation for drink. (Laughter).

Dutch Breach Loading Cannon.—The Secretary laid on the table the remains of a Dutch breach loading Cannon, which he stated had been forwarded by Mr. Russell with the following letter :—

DUTCH BREACH LOADING CANNON.

The ancient piece of ordnance was seen by me some 30 years ago, on *Leonora*, and I lost sight of it until the other day when I found it in one

of the coolie houses. I have sent it to the society thinking it may be of interest to show how far the Dutch had got towards our modern weapons of destruction while they were in possession of this colony.

WILLIAM RUSSELL.

Leonora, 10th April, 1884.

The Secretary said he had seen one of these breach loaders before, and, if he was not mistaken, he believed one of them was in the Museum.

Artificial Mounds behind Anna Catherina.—With reference to these Mr. Russell wrote as follows :—

In connection with the ancient remains which our President referred to as having been found behind "Enmore" and "Cane Grove," I have also to report a find behind "Anna Catherina." On clearing the bush on the site for the No. 1 Canal North polder dam, I was forcibly struck with an apparently artificial dam which began on the very line of my new dam, and ran for a considerable distance into the woods in a northeast direction. An old negro seeing me interested in this peculiar departure in dam making, joined me, and in addition to the dam he pointed out several raised mounds, these he described as yam heaps, and further explained that the raised way and yam mounds were the work of old time run-away slaves, who thus provided a raised way for their huts, and for growing provisions, when the rainy season submerged the surrounding country. It might be interesting to have the opinion of an old time hand on these interesting relics found on the East Coast. My informant told me that he had come across similar mounds to those now referred to behind Annandale on the East Coast.

"Leonora", 10th April, 1884.

Carib Pottery from Pln. Enmore.—On behalf of Mr. im Thurn, the President exhibited a case containing specimens of the Carib pottery recently found on the East Coast, and read rough notes descriptive of this find, by Mr. im Thurn. The substance of their notes will be found embodied in the present number of *Timehri.*

The Treasurer's Accounts.—The Treasurer's quarterly account was laid over showing a balance in favour

of the Society of $3,889 92. Mr. Hawtayne gave notice of a motion he would bring forward at the next meeting of the Society, with regard to the appointment of a committee to take measures in order to carry out the Biennial exhibition of 1885. The meeting then terminated.

Meeting held 8th May.—The Hon. B. Howell Jones, President, in the chair.

Elections.—*Member:* E. F. N. Lynch.

Associate: A. J. Goodridge.

The Biennial Exhibition in 1885.—A notice of motion which Mr. Hawtayne had given, that a Committee be appointed to make arrangements for the Biennial Exhibition to be held in 1885, was withdrawn, it being intimated that the making of such arrangements was within the province of the Committee of Correspondence.

Old Cannon.—The Secretary said he had written to the Government Secretary respecting certain old cannons reported to have been found in the neighbourhood of the Penal Settlement, and requesting that they might be handed over to the Society for preservation in the Museum. He had not received an answer to his letter, but he understood that orders had been given for the removal of the cannons to town.

The late Mr. Campbell.—The Secretary read an extract of a letter from Mr. Walker, the representative of the Society in London, enclosing tenders from two sculptors of repute—Mr. Rock and Mr. Birch—for a bust of the late Mr. W. H. Campbell, the price required

in each case being 150 guineas. Mr. Imlach said he had written home inquiring what would be the cost of an oil painting; and it was decided to defer the further consideration of the subject until a reply is received.

Mauritius Sugar at the Calcutta Exhibition.—The Secretary directed attention to the 9 samples of Mauritius sugar and 5 samples of Indian sugar, which had gained prizes at the International Exhibition at Calcutta, and had been forwarded by Mr. Kirke.

On the 15th January, Mr. Kirke wrote to the Secretary of the Society as follows :—

I have the honour to inform you that I have forwarded to you per ship *Bruce*, which sailed for Demerara this morning, a box containing 21 samples of the Mauritius Sugars exhibited in the Calcutta Exhibition, which I have obtained through the courtesy of Mr. Despissis, the agent in charge of the Mauritius Court. I think that these sugars, which obtain the highest prices in the Indian and Australian Markets would prove of interest to the members of the Royal Agricultural and Commercial Society. I have also forwarded in a press, in care of Dr Ireland, a small box containing samples of Indian sugars, manufactured by Carew's Company, at their "Rosa" sugar mill, in the North West provinces, as I think it might be interesting to the Society to see what is done in India in the way of sugar manufacture. These sugars of Messrs. Carew and Co., are all made from sugar cane. I enclose descriptive list of the samples. The catalogue of Mauritius sugars is in the same box as the samples. The box contains 5 sealed glass bottles of which are (a.a.) ground crystalized white; (a.) crystalized white; (b.) pale yellow.

SAMPLES OF MAURITIUS SUGARS.

No. 1. Vesou Sugar—"Belle Vue," Flacq. Widow Allendy and D. F. Lecourt de Billot.

No. 2. 1st Syrup—"Belle Vue," Flacq. Widow Allendy and D. F. Lecourt de Billot.

No. 3. 2nd Syrup—"Belle Vue," Flacq. Widow Allendy and D. F. Lecourt de Billot.

No. 4. Vesou Sugar—"Mon Desert" Grand Port. T. Thierry, Esq.

No. 5. Extra Large White Moka Crystals—" Compagnie Sucriere de Mon Desert."

No. 13. Vesou Sugar—" Belle Rose," Flacq. Boulle and Co.

No. 14 1st Syrup—" Belle Rose," Flacq. Boulle and Co.

No. 15. 2nd Syrnp—" Belle Rose," Flacq. Boulle and Co.

No. 16. Extra large 1st Clear Crystals—" St. Julien," Central Sugar Estate Co., Flacq.

No. 17. Brewers' Crystals—" Savannah," Savanne. Mrs. Widow Jamin.

No. 21. Extra large Crystals—" Combs," Savanne. Highlands Sugar Estate Co.

No. 25. Extra large White Crystals—" Highlands," Plaines Wilhems. Highlands Sugar Estate Co.

No. 26. Large White Crystals—" Highlands," Plaines Wilhems. Highlands Sugar Estate Co.

No. 27. Large Crystals—" Highlands," Plaines Wilhems. Highlands Sugar Estate Co.

No. 28. Extra White—" Highlands," Plaines Wilhems. Highlands Sugar Estate Co.

No. 29. Extra White Crystallized—" Highlands," Plaines Wilhems. Highlands Sugar Estate Co.

No. 30. Finest Crystallized Yellow—" Maison Blanche," Pamplemousses. Sugar Estate Co.

No. 35. Vesou Sugar—" Bois Cheri," Savanne. Guibert Dalafaye & Co.

No. 36. 1st Syrup—" Bois Cheri," Savanne. Guibert Dalafaye & Co.

Nos. 1, 2, 3, 4, 5, 17, 21, 24, 25, 26, 27, 28, 35, and 36 are manufactured for Australian Market, without animal charcoal, but with the Teery Bernard and Erhmann Superphosphate of Lime process.

Nos. 13, 14, 15, and 30, manufactured chiefly for Bombay Market, no animal charcoal but caustic lime. Defecations, clarifications and evaporations in open pans-battarie. Decanters find evaporation in vacuum.

Nos. 16 and 17—Manufactured for Bombay and Australian Markets, no animal charcoal but caustic lime. Evaporation in the Triple effect of vacuum pan.

SUGAR.—*Samples from the following estates—*

" Belle Vue," Flacq. Mrs. Widow Allendy and F. Lecourt de Billot.

1. Vesou Sugar. 2. 1st Syrup Sugar. 3. 2nd Syrup Sugar.

" Mon Desert," Grand Port. T. Thierry Esq.

4. Vesou, best white crystallized.

Compagnie Sucriere De Mon Desert, Moka.

5. Extra large white crystals.

" Union & Bel Air," Sugar Estate Co., Savanne.

6. Vesou. 7. Syrup.

" Terracine," Savanne. Messrs. Cassignes & Co.

8. Vesou. 9. 1st Syrup.

" Union," Flacq. Mrs. Widow Bournalt de Coudray.

10. Vesou. 11. 1st Syrup. 12. 2nd Syrup.

" Belle Rose," Flacq. V. Bouvelle & Co.

13. Vesou. 14. 1st Syrup. 15. 2nd Syrup.

" St. Julien," Central Sugar Estate Co., Flacq.

16. Extra large 1st clear crystals.

" Savannah," Savanne. Mrs. Widow Jamin.

17. Brewers' crystals.

" Queen Victoria." Messrs. Desveaux.

18. Vesou. 19. 1st Syrup. 20. 2nd Syrup.

" Combo," Savanne. Highlands Sugar Estate Co.

21. Extra large crystals. 22. Medium crystals.

" La Flora," Savanne.

23. Medium crystals.

" Bon Accueil," Flacq.

24. Vesou.

" Highlands," Plaines, Wilhems. Highland Sugar Estate Co.

25. Extra large white crystals. 26. Large white crystals. 27. Large crystals. 28. Extra white. 29. Extra white crystallized. 30. Finest crystallized yellow.

" Deep River," Flacq. L. Mazery & Co.

31. Vesou. 32. 1st Syrup.

" Rich Fund," Flacq. Arnaud & Co.

33. Vesou. 34. 1st Syrup.

" Bois Cheri," Savanne. Messrs. G. Guibert, Delafaye, and Co.

35. Vesou. 36. 1st Syrup.

" Maison Blanche," Pamplemousses Sugar Estate.

37. Finest Crystallized Yellow.

" Riche Bois," Savanne. Mauritius Sugar Estate Co.

38. Vesou. 39. 1st Syrup. 40. 2nd Syrup.

" Etoile," Flacq.

41. Vesou; 42. 1st Syrup. 43. 2nd Syrup.

"Rosalie," Pamplemouses. Mauritius Sugar Estate Co.

44. Vesou. 45. 1st. Syrup. 46. 2nd Syrup.

The President said he wished to make a few remarks with regard to those samples of sugar. Observations of a somewhat disparaging character had been made in the local papers respecting the samples of sugar sent to the Exhibition from this colony, which were said to be far inferior to the Mauritius sugars. It was hardly necessary to say anything in vindication of the ability of this colony to compete with Mauritius in the production of sugar, because all who understood the subject, and paid attention to the market quotations must be perfectly well aware that Demerara sugar commanded in the London market from 1s. to 1s. 6d. per cwt. more than Mauritius sugar. And it should be borne in mind that the samples sent to Calcutta were gathered at a time when this colony was in a rather peculiar position with regard to the production of high-class sugar. The planters were then concentrating all their energies on the production of dark sugar for the American market. Very few estates were making yellow sugar for the English market. And all the samples sent from here were of that description. They were marketable sugars —straw-colored crystals, suitable for the English market. Now, any gentleman who looked at the samples on the table would at once perceive that they were not marketable sugars. If placed in the sales-room of any broker in London they would not be marketable. Small parcels might sell, but they would not sell in any quantity. If 100 tons of such sugar were sent home and offered for sale it would not receive a bid. It would glut the market, and there would be no demand for it. Bearing

in mind the peculiar circumstances under which the samples sent from here were prepared, he thought it was hardly fair to compare them with the samples from Mauritius. Another thing was that this colony was placed at a disadvantage by reason of its distance from India. Sugar was a perishable article, and the voyage from here to Calcutta being at least three times as long as from Mauritius, the samples sent from here could not be expected to arrive in the same condition as those from Mauritius. Demerara need not fear to compete with Mauritius in the production of sugar. If placed on an equal footing he was confident this colony would beat Mauritius any day.

Mr. Nind said the bulk of the Mauritius sugar went to Australia, and was manufactured to suit the Australian market—in very large-grained crystals, which presented a very fine appearance. He fancied the gentleman who had written the letters in which the exhibits from this colony had been described as inferior to those from Mauritius must have judged merely by the appearance of the samples, not from their saccharine richness and marketable value.

The President said we did not compete in the Australian market; therefore to make sugar like the samples on the table would be useless. The planters here took as their standard the sugar which commanded the best price in England, the best market in the world. If it were necessary to make large-grained crystals like those on the table, it could be easily done; but the aim here was to produce sugar which would sell freely in London.

Awards at the Calcutta Exhibition.—The President laid over the following list of awards made at the Cal-

cutta International Exhibition in respect of exhibits from the Colony, which had been published in the *Official Gazette* :—

SUGAR.

1st Class Certificate and Gold Medal ...	...	Pln.	Enterprise.
1st Class Certificate and Silver Medal...	...	,,	Cane Grove.
2nd Class Certificate and Bronze Medal	...	,,	Chateau Margot.
,, do. do. ...	...	,,	Tusch'n d' Vriend'n
,, do. do. ...	...	,,	Hamburg.
,, do. do. ...	...	,,	Taymouth Manor.
,, do. do. ...	...	,,	Peter's Hall.
,, do. do. ...	...	,,	Reliance.
3rd Class Certificate	...	,,	Leonora.
,, do.	...	,,	Farm.
,, do.	...	,,	L'Union.
,, do.	...	,,	Versailles.
,, do.	...	,,	Cornelia Ida.
,, do.	...	,,	Windsor Forest.
,, do.	...	,,	Mara.
,, do.	...	,,	Hampton Court.
4th Class Certificate	...	,,	Houston.
,, do.	...	,,	Met-en-Meerzorg.
2nd Class Certificate and Bronze Medal	do.		J. P. Murphy.

2nd Class Certificate and Bronze Medal..Coffee......Exhibition Com.
1st Class Certificate and Gold Medal.....Souari Nuts......Do.
1st Class Certificate and Silver Medal....Pickles......A. C. Stenson.
1st Class Certificate and Silver Medal....Pickles......Mrs. Carruthers.
1st Class Certificate and Silver Medal....Pickles......Exhibition Com.
2nd Class Certificate and Bronze Medal..Guava Jelly.......Do.
,, do. do. Marmalade........Do.
4th Class Certificate ... Guava Jelly ... ... A. C. Stenson.
3rd Class Certificate..P'd Cherries and G'den apples.Exhibition Com.
2nd Class Certificate and Bronze Medal..Cayenne Pepper Do.
1st Class Certificate and Silver Medal..Guinea Pepper.. Do.
,, do. do. Dried Peppers.... Do.
2nd Class Certificate and Bronze Medal......Honey......Scott & Co.

RUM.

1st Class Certificate & Gold Medal....Collection of Rum.Different Estates

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1st Class Certificate & Gold Medal...Tonka Beans........Exhibition Com.
1st Class Certificate & Silver Medal..Sweet Cassava [Flour & Tannia Flour.Exhibition Com.
1st Class Certificate & Silver Medal..Bitter Cassava [Flour & Plantain Meal...J. P Murphy.
2nd Class Certificate & Bronze Medal. Cassava Flour...A. C. Stenson.
2nd Class Certificate & Bronze Medal..Breadfruit Flour [and Plantain Meal...Mrs. Carruthers.
1st Class Certificate & Silver Medal..Cocoa Beans......Pln. Houston.
2nd Class Certificate & Bronze Medal.. Do. W. Smith.
1st Class Certificate & Silver Medal..Bitters ....Exhibition Com.
2nd Class Certificate & Bronze Medal.. Do. F. D'Almad.
2nd Class Certificate & Bronze Medal.. Do. John Campbell.
3rd Class Certificate & Bronze Medal..Oil Seeds..........Exhibition Com.
2nd Class Certificate & Bronze Medal..Isinglass ....W. Merriman.
3rd Class Certificate.......................Balls Touckong...Exhibition Com.
1st Class Certificate & Gold Medal...Gum Cadaman ... Do.
1st Class Certificate & Gold Medal...Balsam Copaiba... Do.
1st Class Certificate & Silver Medal..Gilbacker Glue.... Do.
1st Class Certificate & Silver Medal.. Do. W. Merriman.
1st Class Certificate & Silver Medal..Locust Gum.......G. Couchman.
2nd Class Certificate & Bronze Medal..Snapper Glue.....J. P. Murphy.
2nd Class Certificate & Bronze Medal..Plated Balata......Exhibition Com.
2nd Class Certificate & Bronze Medal..Gum Hyawa....... Do.
2nd Class Certificate & Bronze Medal..Shark Oil...........W. Merriman.
2nd Class Certificate & Bronze Medal..Comb Fish Oil.... Do.
5rd Class Certificate.......................Laurel Oil..........Exhihition Com.
1st Class Certificate & Gold Medal...Collection Woods. Do.
2nd Class Certificate & Bronze Medal..Collection Barks..J. Bremner, Jnr.
3rd Class Certificate & Bornze Medal.. Do. Edward Seon.
2nd Class Certificate & Bronze Medal..Grass and other [Fibres ....Exhibition Com.
3rd Class Certificate.........................Koomaka Cotton and Silk Cotton...A. C. Stenson.
2nd Class Certificate & Bronze Medal..Ethnological Collection ....Exhibition Com.

1st Class Certificate & Silver Medal...Photographs ......Exhibition Com.

HENRY KIRKE,
Commissioner for British Guiana.

18th March, 1884.

Mr. Garnett was understood to ask whether the awards had been made after comparison of our sugars with those of other countries, or merely after comparison of the samples sent from this colony with each other.

The chairman said he inferred from the Official Notice, signed by the Acting Government Secretary, which described the awards as having been made "in respect of exhibits from this colony," that the samples from here had only been compared with each other.

Consumption of fuel in Boilers.—The President said that, as a sequel to the recent discussions at the meetings of the Society on the burning of green megass in boiler furnaces, he would like to refer to a very important and interesting paper on boilers and fuel that had recently been read at the Institute of Civil Engineers, by Mr. William Anderson, a member of the Institute, and also of the firm of Easton and Anderson, formerly Easton and Amos, who had long been connected with this colony, and had supplied many of our draining engines and other machinery. The paper was of intense interest to those interested in fuel consumption and boilers—and a good many of the members of this Society were so,—and of great interest to everybody. It was written in such language that even those not connected with machinery would have great pleasure and gain much knowledge by reading it. The lecturer thoroughly threshed out the whole system of burning fuel; and expressed the opinion that there was not very much more improvemeut to be made on boilers. He (Mr.

Jones) considered the paper of immense value, and thought it should be reprinted in *Timehri*, and put into the hands of every member of the Society, especially of the young members connected with agriculture. In concluding his lecture, Mr. Anderson referred to the death of Mr. Siemens as the setting of a star amongst engineering society which would be greatly missed; but he (Mr. Jones) thought another star in the form of Mr. Anderson himself, was rising up to take the deceased gentleman's place.

The lecture was published in *Iron*.

Donations.—A copy of the "Dictionnaire Nobilaire," by A. A. Vorsterman Van Oyen, was presented by the author; and a picture representing the appearance of the Public Buildings on the 12th of June, 1838, the day on which Dr. McTurk's bill for the emancipation of the prædials of British Guiana passed, with military honours, was presented by Mr. Hawtayne.—A vote of thanks to both donors was passed.

The meeting then terminated.

Meeting held 12th June, 1884.—The Hon. B. Howell Jones, President, in the Chair.

Election.—*Member:* W. C. Taylor.

Notice of Paper.—The President said, Mr. Nind, at the next meeting of the Society, would read a paper on "Commercial relations with Canada."

Cannon at Mazerooni.—Regarding the two old breech-loading cannons, said to have been lying at Mazerooni

which the Society wished to add to the Museum, the Government Secretary sent a letter to say there were two muzzle-loading cannons at the Settlement, used for firing alarms, but no breech-loaders.

Calcutta Exhibition.—A letter from the Government Secretary was read, stating that the Emigration Agent at Calcutta had had an application from the Indian Government for ten guineas for each of the five Gold Medals awarded to British Guiana for exhibits at the Calcutta Exhibition, and Mr. Mitchell had been directed to pay the amount. This news took the meeting by surprise, and the President remarked upon the meanness of the transaction on the part of the Indian Government,—awarding medals and making the successful exhibitors pay for them.

Donation.—A copy of Dr. Sibson's works was presented at the instance of his widow to the Society, and duly acknowledged.

The Berbice River.—The President then read his promised paper* on the Berbice River and its soils. The speaker's notes had been made during a trip to the district in company with Mr. Nind. He alluded to the great fertility of the soil, highly suitable for coffee and cocoa and offering capital opportunity to the young creoles of the colony to become successful agriculturists, instead of clinging to the town, and make a living by counterjumping. The grass in the district was not good,—coarse and dry, but it might be improved by cultivation. Even if it were, it was not probable that the district

* The publication of this paper is unavoidably postponed to the next number of *Timehri.*—ED.

would ever be able to compete in the business of cattle-grazing with the farms of Australia and Western America.

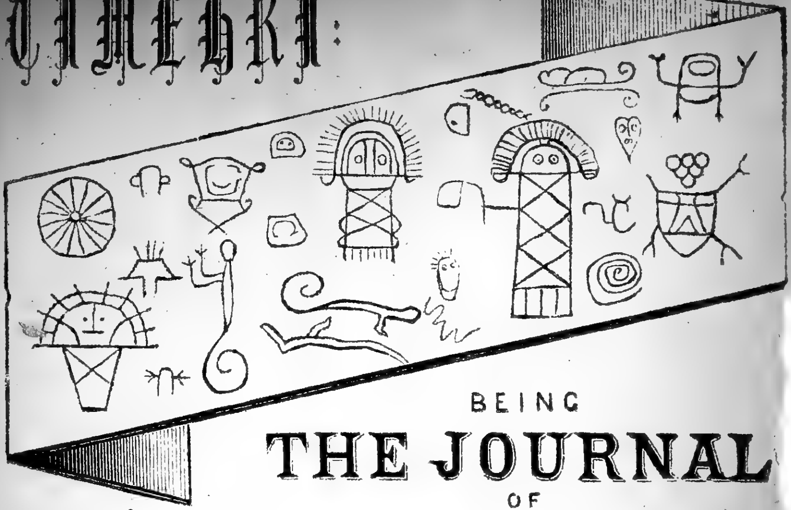
Mr. Nind said the Berbice River, with all its natural advantages, he considered, would push itself forward again and be taken up as a home for settlers as it had been in the past. The analysis of the soil showed about 92 per cent. of sand; that sounded very much against its value for cultivation, but an analytical examination was not everything. He had recently seen a table of the analysis of soil taken from the south of Spain, where the sugar cane was cultivated, and he noticed that between the soils which were headed "fertile" and "unfertile" there was a very slight difference; it was stated that the reason why one soil was fertile and the other not fertile was, that there were great mechanical differences in the tillage, between them. The soil in Berbice River, he thought, was a most peculiar one; if one fingered it was just like the very finest flour, the sort of soil which would feed plants very well; and to this he attributed the fine growth of cocoa and coffee trees which they found on the banks of the river. He thought moreover, that the raising of cattle might be profitably carried on. While admitting that the present grass was tough, he had great faith in the possibility of improving it by burning it and keeping it down by herds, and thought that cattle raising in the Berbice River might be carried on successfully. He believed that the grass in the Berbice River could be improved upon and brought to a better state; and in order to re-open the country and populate it, as it had been formerly when it was a Dutch colony, there were one or two things required. In the first place the Government must remove the present

restrictions from the land—let everybody who can buy land do so, and also lease out the land on pasture licences. Another thing was free emigration, because any one going to that district and investing capital required labour, and the native labour could not be relied upon. The history of the colony showed that the Berbice River was a most valuable part of the colony.

The meeting then terminated.

with the Editors Complimen

TIMEHRI:



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CONTENTS.

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Memoranda on the Palms of British Guiana.

By the Editor.

PROBABLY no country of equal size is richer in palms than is British Guiana ; and on account of their great variety, and still more because of their very great beauty, my attention during my travels has constantly been attracted toward these. Before long I realized that, though the wonderful beauty of palms has been so often commented upon that the word palm in itself suggests something exquisitely beautiful, I had failed, as I believe most who have never seen tropical palms in their native places do fail, to realize that the chief glory and beauty of palm trees consists in the marvellous variety of their beauty. To most home-dwellers the word palm suggests a plant with a straight, rather stiff, stem, crowned by a bunch of, beautiful enough, fern-like fronds ; but it is only after living among the wild palms of the tropics that one realizes the exquisitely varied beauty which these plants show, in stem and root, in leaf and leaflet, in flower and fruit, in their parts and as wholes.* At least one other traveller, Mr. A. R. WALLACE, has dwelt on this beauty of variety ; and he has attempted, as I fear to attempt, to describe in words,

* " As we advance toward the temperate zone, the plants of this family (palms) decrease in size and beauty. What a difference between the species we have just mentioned and the date-tree of the East, which unfortunately has become to the landscape painters of Europe the type of a group of palm-trees ! It is not surprising that persons who have travelled only in the north of Africa in Sicily, or in Spain, cannot conceive that, of all large trees, the palm is the most grand and beautiful."
HUMBOLDT, Personal Narrative. Bohn's Edition. Vol. ii. p. 257.

and in pictures, something of this beauty.* He has failed conspicuously in this, as he has failed in hardly anything else. Where he has failed, I shall not attempt to succeed; but I am certain that a traveller who would in any adequate way use his pencil and his pen to picture for those at home the beauty of palms would add not a little to the pleasures of the world.†

But in addition to their stately beauty, palm trees are vividly interesting by reason of the many uses to which they may be, and are, put. No better illustration of this could be found than the account which I shall presently have to give of the products and uses of one of our commonest species (*Mauritia flexuosa* Lin :).

The notes herein to be set in order have been accumulating since the autumn of 1879, when my friend Mr. JENMAN and I spent some months on the Corentyn river, paying special attention to the palms, which seem to be present in even greater variety on that river than elsewhere in the colony. We then made unusually elaborate collections of herbarium specimens of these plants, which are seldom adequately represented in even the greatest herbaria, on account of the great labour of

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* "Palm Trees of the Amazon, and their Uses," by Alfred Russell Wallace. London, 1853.

† For the Edinburgh Forestry Exhibition, I recently superintended the taking of a large number of large photographs of various species of palm, especially of one of the most beautiful of all our palms, the cokerite (*Maximiliana Martiana*: Karst). The result was somewhat disappointing to the high expectations which I had formed, chiefly on account of the difficulty of exposing the plates sufficiently long without the wind moving the leafage. But engravings or drawings intelligently made by a botanist from these photographs would probably better represent palms than could easily be accomplished in any other way.

preparing specimens; and at the same time I took a careful series of measurements of every species of palm with which we met. My collection, together with a part of Mr. JENMAN'S almost parallel series, was sent for identification, partly to Professor TRAIL of Aberdeen, the chief English authority on the palms of South America, and partly to Professor DRUDE, the great German specialist in the same subject. Professor TRAIL kindly sent me his identifications and notes; and these will afford me perhaps the most valuable aid in the compilation of this paper.

It might perhaps be better to rest satisfied with the publication of the notes on the species actually observed during the above mentioned journey on the Corentyn but that I am anxious to make this paper a complete record of all the facts hitherto observed concerning the palms of British Guiana. In attempting this I must, however, guard myself against any possible imputation of attempting a history of the palms of the district. My notes are rather a gathering together of the very scattered, and almost wholly inaccessible, facts as yet known on this subject; and the object is to make it easier for future students to investigate this interesting subject. There is no family of plants which presents greater difficulties to the travelling botanist than does that of the palms. On account of the great difficulty, already mentioned, in procuring and preserving adequate specimens, comparatively little has been written about these plants. There is, it may almost be said, but one standard and authoritative work on palms*; and that

* Historia Naturalis Palmarum, Munich, 1823-50. Three Volumes Imperial folio, with 245 plates, partly coloured.

one is a rare work, seldom coming into the market, and, on the few occasions on which copies are offered, selling for a great price; and it is, moreover, very bulky. It is therefore seldom that a botanical traveller has access to a copy; and never, probably, can such an one carry with him a copy to serve as a guide when he is actually under the shade of living palms. The few other important notices of palms are for the most part contained in papers scattered through many books and periodicals dealing with more general subjects. But if the literature of palms generally, is either so inadequate, or so inaccessible for the purposes of the botanical collector, the literature of the palms of British Guiana is yet very far more inaccessible. Indeed the only notice of this subject at all worthy of mention, is the bare and somewhat unsatisfactory list included in Dr. RICHARD SCHOMBURGK'S general list of the flora of British Guiana.* The palms from that list I shall insert, in this paper; but as many of the species there mentioned have certainly been very inadequately determined—owing, no doubt, to the great difficulty of the task—I have inserted all such as have not been recently re-determined between brackets.

As regards the general arrangement of these notes, it will be found that the various genera are classed as in the latest, and recently completed, volume of HOOKER and BENTHAM'S Genera Plantarum. The species are arranged alphabetically in their genera. To further the purpose of making these notes a guide to future students of the palms of our colony, defini-

* Reisen in Britisch Guiana. Leipzig 1848, Vol. iii.

tions of the various tribes and sub-tribes, quoted from SIR JOSEPH HOOKER, and definitions of the genera, quoted for the most part from GRIESBACH'S "Flora of the West Indies," have been inserted. Seventy species, belonging to twenty-one genera, are recorded from this district, though of these some few have possibly been included by mistake. Of these species the greater number are somewhat evenly, and in comparative abundance, distributed throughout the district. Some few, for instance *Orbignia Sagotii, Trail* and *Astrocaryum plicatum, Drude*, seem to be confined to one or two very limited spots. A few others, nearly all on the authority of RICHARD SCHOMBURGK, seem to be confined to certain remote districts of the colony, but to be there fairly abundant. SCHOMBURGK has, for the general purposes of his flora, distinguished the colony into four regions, thus: the coast region, now mostly cultivated and with many exotics mingled with its indigenous plants: the forest region: the sandstone region, almost entirely mountainous, and including the far-famed Roraima: and, the savannah region, rather undulating than mountainous, and for the most part granitic. Making use of this division into regions, in the following synopsis of the palms recorded from Guiana the apparent distribution of each species is indicated:

SYNOPSIS OF THE PALMS OF BRITISH GUIANA.

Hyospathe elegans. Mart: ... ...Forest (Canakoo M.), sandstone.
Euterpe edulis. Mart: ... ...Throughout colony.
E. oleracea.[1] Mart: (teste Schomburgk) ,,

[1] *Euterpe oleracea,* given on the authority of Schomburgk, seems to me perhaps identical with the one I have given as *E. stenophylla*, Trail.

E. stenophylla.[2] Trail.	...	...Forest region (& throughout).
Leopoldinia insignis.[3] Mart. (teste Schk.)		,,
L. pulchra. Mart : (teste Schk.)	...	,,
Œnocarpus Bacaba. Mart : (var.)	...	,,
Œ. Batawa. Mart : ...	... ...	,,
Œ. minor. Mart : (teste Schk.)	...	,,
Oreodoxa oleracea.[4] Mart :	...	...Not indigenous ?
O. regia. Kth :	... ...	,,
Iriartea ventricosa. Mart : (teste Schk)		...Forest and sandstone.
Socratea (Iriartea) exorhiza. Wendl :		...Throughout colony.
Chamœdorea gracilis. Wild : (teste Schk).		Forest and sandstone.
C. pauciflora. Mart : (teste Schk.)		...Forest, sandstone & savannah.
Geonoma acaulis. Mart : (teste Schk.)		...Sandstone & savannah.
G. arundinacea. Mart : (teste Schk.)		...Forest, sandstone & savannah.
G. baculifera.[5] [Kunth ?]	...	... ,,
G. deversa. Kunth. (teste Schk.)		...Forest.
G. elegans. Kunth. (teste Schk.		... ,,
G. laxiflora. Mart : (teste Schk.)		...Forest and savannah.
G. macrostachys. Mart : (teste Schk.)		...Forest.
G. maxima. Kunth. (teste Schk.)		...Forest and sandstone.
G. paniculigera. Mart : (var.)...		...Forest.
G. Poiteauana. Kunth (teste Schk.)		... ,,
G. Spixiana. Mart : (teste Schk.)		... ,,
G. stricta. Kunth. (teste Schk.)		...Forest and savannah.
Manicaria saccifera. Gaertn :...		...Forest.
Lepidocaryum gracile. Mart :(teste Schk).		Forest and sandstone.
L. tenue. Mart : (teste Schk.)...		...Forest.
Mauritia aculeata. Hb. & Kunth.		...Forest and sandstone.
M. armata. Mart : (teste Schk.)		...Forest.

[2] *E. stenophylla,* Trail, is one of my new species named by Trail, though I am not sure if he has yet published it.

[3] The two sp. of *Leopoldinia,* given on the authority of Schomburgk, I have never seen, though Schomburgk alludes to them as widely distributed !

[4] I regard the *Oreodoxas* as escapes from cultivation ; but as Mr. Jenman thinks they may *possibly* be indigenous I have included them, but in brackets.

[5] For this plant, which is apparently identical with Schomburgk's *G. acutiflora.* Mart. see p. 238.

M. flexuosa. Lin. ... ...Throughout colony.
Bactris acanthocarpa.[6] Mart. (teste Schk).Forest.
B. acanthocarpa crispata. Drude. ... ,,
B. aristata. Mart : (teste Schk.) ... ,,
B. concinna. Mart : (teste Schk.) ...Forest, sandstone & savannah.
B. leptocarpa.[7] Trail... ... ...Forest.
B. longifrons. Mart : (teste Schk.) ... ,,
B. macrantha. Mart : (teste Schk. ... ,,
B. major. Jacq : (teste Schk.)... ... ,,
B. minor.[8] Jacq : (*Guilielma speciosa.* Mart :) Only as an escape.
B. maraja. Mart: (teste Schk.)... ...Forest & sandstone.
B. megalocarpa[7]. Trail ... ...Forest.
B. mitis. Mart : (teste Schk) ... ... ,,
B. pectinata. Mart : (teste Schk.) ... ,,
B. simplicifrons. Mart : (teste Schk.) ... ,,
B. tricospatha. Trail ... ... ,,
Desmoncus macranthus. Mart: (teste Sk.)Forest and sandstone.
D. mitis. Mart : (teste Schk.) ... ...Forest and savannah.
D. palustris. Trail ... ...Forest.
D. polyacanthus. Mart : ... ...Forest, sandstone & savannah
D. setosus. Mart : (teste Schk.) ...Forest.
Astrocaryum aculeatum.[9] Meyer (teste S) ,,
A. gynacanthum.[10] Mart : (teste Schk.)...Forest and sandstone.
A. gynacanthum var. *Munbacca* (sp) Mart.Forest.
A. jauari. Mart : (teste Schk.) ...Forest, sandstone & savanna h
A. murumuru. Mart : (teste Schk. ...Forest and sandstone.
A. plicatum. Drude ... ...Forest.
A. tucuma.[11] Mart : ... ... ,,

[6] Possibly the true *B. acanthocarpa* Mart. does not occur in Guiana, but is represented by its variety *crispata* Drude.

[7] New species named, but possibly not yet published, by Professor Trail.

[8] This species is very commonly cultivated and occurs only where it may probably be an escape.

[9] A very doubtful species. See p. 261.

[10] Possibly *A. gynacanthum* is represented in Guiana only by its variety *Munbacca,* which however Schomburgk makes a separate species.

[11] Schomburgk's *A. tucuma* Mart: is, evidently from his note, not the true *A. tucuma* Mart.

A. tucumoides. Drude ...	... ,,
A. vulgare. Mart : (teste Schk.)	...Forest and sandstone.
Acrocomia lasiospatha. Mart :...	...Forest.
A. sclerocarpa. Mart : (teste Schk.)	...Forest and sandstone.
Martinezia caryotæfolia. H. & K. (teste S)	,,
Elæis melanococca. Gaertn : (teste Schk)	..Forest.
Maximiliana Martiana. Karst :	...Throughout the colony.
Attalea funifera. Mart : (teste Schk.)	...Forest.
A. speciosa. Mart : (teste Schk.)	...Forest and savannah.
Orbignia Sagotii.[12] Trail ...	...Forest.

TRIBE I. ARECEÆ.

[" Leaves pinnate, leaflets with the sides reflexed before unfolding. Flowers unisexual, often in threes (one female between two males)." *Hooker.*]

SUB-TRIBE I. ONCOSPERMEÆ.

[" Spadix flowering below the leaves ; spathes 2. Flowers monœcious ; males symmetrical or not, with broad imbricate sepals, females with imbricate petals. Ovary 1-celled, 1-ovuled. Fruit with eccentric lateral or basal stigmas —Old and new world palms, often spinous." *Hooker.*]

GENUS I. HYOSPATHE.

[" *Perigone* exterior, male cupular, 3-fid, female 3-partite : interior in both sexes 3-phyllous. *Stamens 6 :* no rudimentary organs in female. *Ovary* 3-celled : stigmas 3, sessile above the base of the fruit. *Berry* 1-seeded, *Albumen* entire : embryo lateral above its base."—Unarmed palms ; trunk arundinaceous, annulate ; leaf-segments flattish, often several cohering ; spadix lateral below the leaves, simply branched, equalling the inner spathe : branches spreading, thickened at the base : flowers sessile : bracts obsolete ; ' berry ovoid' ".*Griesbach.*]

[*H. elegans, Mart:* According to SCHOMBURGK this plant occurs in the forest region, in the Canakoo mountains, in the sandstone region, in the Humirida mountains and in thin coppices on the savannahs. It is said to flower in August and September.]

GENUS II. EUTERPE. *Gærtn.*

[" *Perigone* exterior and interior 3-phyllous. *Stamens* 6 ; no, or

[12] A new sp. named, but possibly not yet published, by Prof. Trail.

'minute', rudimentary ones in female. *Ovary* 3-celled: stigmas 3, sessile, lateral, excentrical in fruit. Berry 1-seeded, fibrous. *Albumen* ruminate, embryo basilar.—High, unarmed palms: leaves pinnatisect; segments flattish; spadix lateral below the leaves, simply branched, equalling the inner spathe; branches long, fastigiate, at length spreading: flowers sunk into concavities, bracteolate; berries globose." *Griesbach.*]

E. edulis, Mart:

LOCAL NAMES.

Creole..Manicole.
True Carib.....................................Wassi.
Arawak ....Manaka.
Warrau ....Morrokke.

Cœspitose, having up to 12, or even more, slender, seldom straight stems from one mass of, partly aerial, roots. These clumps are formed by the young shoots sprouting from the base of the original stem, at an early period of its growth. The diameter of the old clumps at the base of the aerial roots is sometimes as much as 14—20 feet. The largest clumps are those in swamps in the forest, generally at the head of some small creek; those immediately on the banks of the larger rivers are, as a rule, smaller. The numerous aerial roots form a dense, impenetrable mass.

MEASUREMENTS.*—Height of aerial roots 3 ft. 3 inches from summit of aerial roots to base of leaf-stalks 5 ft.; from top of sheath to lowest pinnæ 10 inches. Length of leaf from base of leaf-stalk, 7 ft. 10 inches. Breadth of leaf 2 ft. 3 inches. Girth of trunk above aerial roots 2 ft. 3 inches; at middle of stem 1 ft. 6 inches; just below sheath of leaf-stalk, 7 inches.

This very beautiful and graceful palm is widely distributed throughout the colony, but, being a swamp plant, is far more abundant in the low alluvial coast-lands than in the interior of the colony. In the last mentioned place it is restricted to the moist, wooded swamps at the heads of creeks.

* In all cases the measurements given have been actually taken from apparently average specimens.

The uses to which the various parts of the manicole are put are many. The split stem is used by Indians for flooring huts in muddy places and in houses raised on piles; and these laths are also used by creoles and East Indian and Chinese immigrants for making palings and partition walls in their houses. Smaller laths split off from the stem are also occasionally used, to string the geonoma leaves for thatch on; but laths from the booba palm (*Socratea exorhiza.* Wendl :) are preferred as much more durable, for this purpose. Pieces of the unsplit stem of the manicole are also used, after having been half divided in the middle and bent into the shape of a boat's "knee," to fasten down the thatching of the ridge of houses thatched with the leaves of the troolie (*Manicaria saccifera).* The thin and easily withered leaves of the manicole itself are seldom used as thatch, and then only for temporary huts, erected by Indians while travelling. Bundles of the easily procured leaves are also often used to cover and shelter hammocks and other properties in the Indians' canoes. The cabbage when boiled makes a most excellent vegetable, tasting like thistle-artichokes; but this fact seems little known, and the article is seldom made use of in this colony, either by Indians or others. From the ripe fruit an excellent chocolate-like drink is easily and occasionally, but here seldom, prepared. The inner skin of the spathe is used, instead of paper, for cigarettes, by the Arawak and Warrau Indians; whereas the Carib tribes more commonly use for this purpose layers of the bark of a forest tree (*Lecythis*).

[*E. oleracea, Mart* :—According to SCHOMBURGK this

plant is common throughout the colony, and its distribution is much the same as that which I have ascribed to *E. edulis*. It seems not improbable that the plant intended by SCHOMBURGK is that which will be described next in these notes.]

E. stenophylla, sp. nov. Trail, E. oleraceæ, Mart: (*affinis*).

LOCAL NAMES.

True Carib..Wabòo
Arawak..Rayhòo
Warrau..Weenamòri.

This palm is, at first, easily confused with *E. edulis,* the two often growing together, at least on the banks of the larger rivers, and being in other respects somewhat alike. The chief points which distinguish *E. stenophylla* are, that it grows, not in clumps, but singly: not in swamps but on comparatively dry ground, and consequently the aerial roots are few and slight or even hardly existing: the stem is straight and much stouter than in *E. edulis,* and the whole plant, except in height, is altogether much larger: the leaflets which are narrower than in *E. edulis,* start more abruptly from the mid-rib and have comparatively little curve; and the frond is not so fibrous and tough in texture, for which reason the Indians say they never cut them for thatching purposes, as they shrivel up in a few days.

MEASUREMENTS:—Height of stem to base of leaf, 50 ft. or more; average length of leaf 10 ft.; girth of stem just above roots 2 ft. 10 inch.; at two ft. above roots 1 ft. 6 inch; at four feet above roots 1 ft. 10 inch.; at base of leaf-stalk, 1 ft. 8 inches.

The palm is, as has been said, abundantly scattered among the manicole on the banks of rivers, where the ground is comparatively dry. In the manicole

swamps in the forest, where the ground is always saturated with water, *E. stenophylla* apparently does not occur.

As regards its use, the cabbage is eatable and a drink may be prepared from the fruit, as in the case of *E. edulis*; but, unlike the latter species, the fronds are of little use as thatch and the stem which is said not to split so easily, is not often used.

GENUS III. LEOPOLDINIA.

Flowers small, reddish, monœcious; fruit a roundish one-seeded berry, yellowish-green; leaves fine, pennatisect, trunk middle sized, straight, unarmed.

[*L. insignis, Mart*:—According to SCHOMBURGK this occurs "on the Pomeroon, Barama and their tributaries." Yet, knowing these rivers well, I have never noticed any palm attributable to this genus.]

[*L. pulchra, Mart*:—This, writes SCHOMBURGK, occurs "on the banks of the Essequibo, Pomeroon, Barama and Barima." My comment on this statement must be the same as in the last case.]

GENUS IV. ŒNOCARPUS.

Perigone exterior and interior 3-phyllous, imbricating in the female, stamens 6, (or 5), berry one-seeded, fibrous, inner spathe 5 ft, long, outer ⅓rd as long, spadix simply pinnate, branches numerous, pendent, leaves uninterruptedly pinnate, stem high, cylindrical, unarmed.

Œ. Bacaba, Mart. var xanthocarpa, Trail. *

LOCAL NAMES.

Arawak..Low
Macoosi..Koomeri

* Schomburgk gives his plant as the typical Œ. Bacaba, Mart: a form of which, though it very possibly occurs in Guiana, I have no experience. I have, therefore only given Trail's variety *xanthocarpa,* which was collected by Jenman and myself on the Corentyn and which appears to be identical with the form very common on the Essequibo and other rivers.

The stem in the older and higher plants is entirely free from trash; but in younger examples the sides of the sheathing parts of the leaf-stalk (often very persistent) carry a good deal of stiff bristle-like, black trash, in some plants clothing almost the whole length of the stem. The stem itself, according to JENMAN, is 'strictly cylindrical;' though my own impression, based on the measurements given below, is that it diminishes in diameter from the base to top. The sheathes of the leaf-stalk only clasp the stem for a short distance above their point of lowest attachment, and not throughout the length of the sheath as in our two species of *Euterpe*. The spathe is narrow and long; soon after bursting it breaks off from the stem, in a straight line of fracture, and falls; whereas in both species of *Euterpe* the spathe persists for some time after bursting. "The whole plant" I find in a note by Mr. JENMAN, "is conspicuous and readily recognized at a distance by the peculiar coloured, reddish-brown tomentum coating the spathes." It flowers chiefly in October, though a few plants may be found in flower probably at any time of the year.

MEASUREMENTS.—Height of aerial roots 1 ft. 3 inch.: from top of aerial roots to base of leaf-stalk=38 ft. 10 inch. Girth of aerial roots at ground=7 ft.: of trunk above aerial roots=2 ft. 10 inch.: of trunk at two feet above aerial roots=1 ft. such: of trunk just below leaf-sheath= 1 ft. 7 inch. Greatest girth of trunk formed by the sheathing of the leaf-stalks=4 ft. 3 inch. Length of leaf from base of sheath to top=25 ft.: from same base to lowest pinnæ=7 ft. 7 inch.: greatest width of leaf 5 ft. 6 inch.

This plant is distributed somewhat sparingly along the bank of the Corentyn and in swamps at some distance back from that river, and also in similar places on the

Berbice, Demerara and Essequibo. On the Pomeroon and the rivers between that and the Orinoco it does not seem to occur. According to SCHOMBURGK it (or rather, according to him, the true *Œ. Bacaba*, *Mart*) occurs thoughout the interior even in the sandstone and savannah tracts.

The leaves are used as thatch where other, better material is not to be had, and the fruit, like that of the next species to which it is preferred, for making with flour a fermented drink. I know of no other use to which any part of the tree is put.

Œ. Batawa, *Mart* :

LOCAL NAMES.

True Carib	Patawa. *
Arawak	Tooroo.
Warrau	Mohee

I am indebted to Mr. JENMAN for the following excellent description of this palm.—" Trunk 40 ft. high, unarmed, 8 in. in diameter, cylindrical throughout, scars distant below, approaching above ; petiole shortly clasping, the edges furnished with matted coir ; leaf about 15 ft. long, uninterruptedly pinnate ; leaflets 4 ft.long, 4 inch. wide plaited, acuminate at the apex, once folded at the base, very glaucous beneath ; spathe 5 ft. long, sharply acuminate, outer spathe $\frac{1}{3}$ as long ; spadix as in *Euterpe* and *Oreodoxa* ; fruit—?; seed about the size of a nutmeg, thickly covered with loose fibre ; fl. in October."

To this I may add that the ripe fruit is of a very dark plum colour.

* It is a rather curious fact that, according to Wallace, the name of this palm in that strange composite tongue the *lingoa geral* is our Carib word *patawa*.

It grows in similar places to the last species. On the Corentyn, where we first noticed this palm, there is something curious about its distribution; full grown plants are there so scarce that, though eager to find it, I never saw an example, while in the same place young plants were very common. It occurs on the Canje, Berbice, Demerara and Essequibo, and is very abundant on the Pomeroon and rivers onward from that. According to SCHOMBURGK it is distributed also through the sandstone and savannah regions.

Its leaves are much used as thatch, where less divided leaves, such as those of the *Manicaria*, can not be had. Its fruit is often made into a drink, such as the Brasilian assai; and is much sought after and eaten, boiled, by the Indian.

According to WALLACE the long straight fibres attached to the petioles of the leaf-stalks are used by the Brazilian Indians as darts for their blow-pipes; but they are apparently never used for that purpose here. These fibres, by the way, I should describe rather as bundles of stiff thick bristles than, with Mr. JENMAN, as matted coir.

It may not be out of place to add that toucans are exceedingly fond of the ripe fruit of the tooroo; and will, in some marvellous way, swallow four or five of these fruits, of the size of pigeons' eggs, and very hard, in a very few seconds.

[*Œ. minor, Mart*:

This palm, according to SCHOMBURGK, is found on the upper Essequibo, and flowers throughout the year. It seems closely to resemble, but to be smaller in all its parts than, *Œ. baccaba.*]

GENUS V. OREODOXA.

["*Perigone* exterior and interior 3-phyllous, the latter valvate in female. Stamens 6-9. Ovary 3-celled, surrounded by a 6-dentate cupule: stigmas 3, sessile, suprabasilar in fruit. Berry drupaceous, 1-seeded: putamen adnate to the testa. *Albumen* entire: embryo basilar.—High, unarmed palms; leaves pinnatisect, pinnæ 2-fid at the top, petiole long-sheathing; spadix at the base of the cylinder formed by the leaf-sheaths, thrice-twice divided, equalling the inner, lignescent spathe: flowers sessile, lanceolate, berries ovoid or oblique, blueish." Griesbach.]

[*O. oleracea, Mart*:

LOCAL NAME.

Creole ... ... Cabbage palm.

(This name is applied indiscriminately to the two or more species here growing.)

This and the following species are given by SCHOMBURGK as cultivated plants in Guiana; nor have I ever seen them in a state in which they could be said to be truly wild. Mr. JENMAN however thinks that one or more of the species may possibly be indigenous; for which reason I have included them. It may be as well to add that Mr. JENMAN has detected more than two species among the very numerous examples of *Oreodoxa* growing in Georgetown.*]

* Mr. Jenman has given me the following note.—"The following are the distinctive characters of two of the three cabbage palms found in Guiana. The third is a very distinct plant in appearance, but all the specimens known to me are too high, and stout in stem, to be climbed, so that I have been unable to obtain flowers to determine its specific characters. It is the most rapid growing and tallest of the three kinds.—The common cabbage palm is described in the left-hand column: the other is locally rare, only about three or four plants being known to me.

No. 1.	No. 2.
1. Fruit ovate-oblong, 6-8 lines long, purple when ripe.	1. Fruit spherical, ¼ inch diameter, whitish-green or light purple, when ripe.

[*E. regia, Kth:*
(See remarks on the previous species).]

SUBTRIBE II. IRIARTEEÆ.

[Spadix flowering below the leaves; spathes numerous. Flowers monœcious; males symmetrical with broad imbricating sepals; females with imbricating petals. Ovary entire, 3-celled, 3 ovuled; fruit 1 seeded with terminal lateral or basal stigmas.—Unarmed American palms, with wedge-shaped leaflets." Hooker.]

GENUS VI. IRIARTEA.

"Flowers monœceous, fruit a one-seeded berry of a yellowish-brown or blackish colour; leaves pinnatisect; leaflets trapeziform, plicated, the outer edge truncate and inciso-serrate; stem high unarmed."

[*I. ventricosa, Mart:*

According to SCHOMBURGK, this plant occurs in the Canakoo mountains, and throughout the sandstone region, flowering in January.]

GENUS VII. SOCRATEA, *Karst.*

["Perigone of female flowers 2-serial, outer entire, inner 3-phyllous male — ? Spadix produced among the leaves, simply pinnate;

2. Female flowers immediately under the males.

3. Male flowers pale whitish, $1\frac{1}{2}$ lines long, stamens 6 only, white.

4. Dust-crystals in spathe very little in quantity.

5. Branches and branchlets of spadix lax, distinct, and very zig-zag.

6. Leaflets deeply cleft at their tips, not folded, 6-8 inches shorter than those of No. 2.

7. Mouth of outside basal sheath of spathe constricted.

8. Trunk very stout, nearly cylindrical above the base, even; growth rapid.

2. Female flowers under, or beside, the males.

3. Male flowers pink, $2\frac{1}{2}$ lines long, stamen 6-9, dark-pink.

4. Dust-crystals in spathe copious.

5. Branches and branchlets of spadix much more numerous than in No. 1 and much less zig-zag.

6. Leaflets shortly cleft at the tips, folded, the rows with a wider angle of divergence than in No. 1, making the leaf more plumose.

7. Mouth of the basal sheath of spathe as wide as the part below.

8. Trunk moderately stout, sub-cylindrical, uneven by slight, irregular, contraction and expansion; growth slow."

branches few, spathes three, each one twice as long as the next outer one, the inner shorter than the spadix ; fruit a berry about as big as a nutmeg, albumen ruminate, leaves interruptedly pinnate ; leaflets sub-trapeziform the outer " edge truncate and jagged, trunk tall, unarmed.]

S. exorhiza, Wendl.

(= *Iriartea exorhiza, Mart:*)

LOCAL NAMES.

Creole ?	...	...	...	Booba.
True Carib	...	...	...	Passayu.
Arawak	...	...	...	Koofa.
Warrau	...	...	...	Mooanari.

Stem straight, cylindrical (but occasionally somewhat swollen at irregular intervals). Fruit yellowish, bitter in taste.

Measurements.—Heights of aerial roots = 5 ft. ; of trunk above aerial roots = 28 ft. ; of sheathing part of leaf stalks = 2 ft. 8 in. Length of leaf from top of sheath = 8 ft. Girth of trunk just above aerial roots = 1 ft. 3 inch; at middle = 1 ft. 3 in. ; just below sheath 9 inch.

This palm grows singly, scattered through swamps in the forests and on the banks of most of the rivers. According to SCHOMBURGK it is distributed throughout the interior.

Our specimens from the Corentyn, Professor TRAIL regards as not exactly the true *I. exorhiza, Mart*: but as " approaching the variety *Orbigniana.*"

The stem is split into laths on which the leaves of the dahlibanna palm (*Geonoma baculifera*) are strung ; and the whole is used as an exceedingly effective and portable thatch. The wood is said to be unusually durable. The seeds, being bitter, are not eaten.

SUBTRIBE III.—CHAMÆDOREÆ.

[" Spadix flowering amongst or below the leaves ; spathes numerous. Flowers usually diœcious ; male, calyx minute ; female, petals valvate or imbricate. Ovary 3-celled, 1-3-ovuled. Fruit small with basal stig-

mas.—Unarmed, or rarely armed, palms of the old and new world."—HOOKER.]

GENUS VIII.—CHAMÆDOREA.

[*C. gracilis, Wild*:

According to SCHOMBURGK this palm occurs in the Canakoo and Tooarootoo mountains in the forest region, and also in the Humirida mountains in the sandstone region, flowering in March and April.]

[*C. pauciflora, Mart*:

SCHOMBURGK states that this occurs on the upper Essequibo and in the Canakoo mountains, in woods near Roraima and the Humirida mountains, and in coppices and on river-sides in the savannah region. It flowers, he says, in August and September.

I myself have never seen any palm of this genus in Guiana.]

SUBTRIBE IV. GEONOMIEÆ.

["Spadix flowering amongst the leaves; spathes 1-2, rarely more. Flowers diœcious, or if monœcious on separate spadices; perianth dry; males unsymmetrical, much compressed with petals connate below; females with imbricate petals. Ovary 3-celled, 3-ovuled. Fruits small with basilar stigmas.—Unarmed palms of the old and new worlds."—Hooker.]

GENUS IX. GEONOMA.

[*Flowers* with their bracteoles sunk into the alveoles of the rachis. *Perigone* exterior 3-phyllous, interior ... 3-phyllous, ... 3-fid (or closed, circumsessile). *Stamens* 6, monadelphous: anther-cells usually distinct, reflexed. Ovary 1-celled, surrounded by a 6-dentate cupule; style 3-fid, supra-basilar. *Berry* with the albumen entire; embryo at its base. . . . . Trunk arundinaceous, rarely none; leaves pinnatisect-bifid, usually unequally divided: segments flattish, with the base often broadly adnate; spathes several—2 at the base of the spadix, marcescent."—Griesbach.]

[*G. acaulis, Mart*:

According to SCHOMBURGK this grows in the Canakoo mountains, and in moist spots in the savannah region, flowering in January and February.]

[*G. arundinacea, Mart*:

Distributed throughout the country, according to SCHOMBURGK, and flowering in January and February.]

[*G. baculifera*, (*Kunth*?).]

LOCAL NAME.

Arawak.......................................Dahlibanna.

Specimens of this plant I sent to Professor TRAIL from the Corentyn River, where, as on many other of our rivers, it is very abundant. His m. s. note on it is that it is *G. baculifera* = *G. acutiflora, Mart.* The authority for the species '*baculifera*' seems to be KUNTH. I am not sure whether DR. TRAIL means that *G. baculifera, Kunth* and *G. acutiflora, Mart:* are identical; and, in the absence of books of reference, I am quite unable to test this point. SCHOMBURGK, I see, gives in his list of palms both *G. acutiflora, Kunth*, and *G. baculifera, Mart.* I have only included one of these two in the present list, which I have called *baculifera*, with a doubtful authority, but which is identical with *G. acutiflora, Mart.*

The plant varies in height from 2 or 3 ft. to 7 or 8. The leaf is sometimes simple, sometimes partially pinnate and sometimes regularly pinnate, all three forms occasionally occurring on one and the same plant. Aerial roots are sometimes sent out from the joints of the stem, even from the highest. Young shoots also

occasionally start from the joints, but these never seem to develop far. The flower is very fragant; the fruit oval and dark purple in colour. Flower and ripe fruit are sometimes co-existent.

On the Corentyn great quantities of this grow in damp and shady places in the forest, generally at some distance from the river, but probably flooded in the wet season. Similar masses of a hardly distinguishable, but generally considerably taller, *Geonoma* grow in similar places and ways on other rivers, notably on the Morooka in the Pomeroon district.

SCHOMBURGK'S account of the distribution of his two species is: that *G. acutiflora, Mart:* occurs in moist forests on the Barima and Pomeroon, in forests near Roraima, and in most places on the savannahs, flowering in all these places in January and February; and that *G. baculifera, Kunth,* occurs in moist forests in the Canakoo mountains, in the Humrida mountains, and in moist places on the savannah, flowering also in January and February.

As regards its uses, dahlibanna makes, with the exception of troolie (*Manicaria*) the best thatch of any of our palms. The leaves are strung on long straight laths, cut from the stem either of the booba-palm (*Socratea exorhiza, Wendl:*) or, though these are not nearly as durable, of the manicole palm (*Euterpe edulis, Mart*). The leafstalk is bent over the lath, so that it hangs down on one side, the leaf on the other and is fastened in that position with a strip of iturite (*Ichnosiphon*); and many leaves having been thus strung side by side, the strip of thatch thus produced is treated as a tile. The advantage of this kind of thatch is that,

being in large pieces, it can be taken off a house and put on again, with very little trouble. I have known an Indian who had two houses, one being for occasional use up a distant creek, carry with him the dahlibanna thatch from one house to the other on the occasions of his changing his residence.

The long stem of this palm, or at least of the palm, which is I think this, which grows so abundantly on the Morooka, is much used by the more civilized Indians for making very neat and extraordinarily durable wattled partitions in, and fences round, their houses.

The pretty jointed stems of this and other *Geonomas* are well known in Europe as walking sticks; but I am not aware that any have been exported from this colony for that purpose.

[*G. deversa, Kunth,*

According to SCHOMBURGK, this occurs in the moist forests of the Pomeroon and Barima, flowering in February.]

[*G. elegans, Mart*:

According to SCHOMBURGK, this occurs in the moist forests of the Essequibo and Pomeroon flowering in February.]

[*G. laxiflora, Mart*:

According to SCHOMBURGK, occurs in the Canakoo mountains and in moist spots on the savannah, flowering in January and February.]

[*G. macrostachys, Mart*:

According to SCHOMBURGK, occurs in the Canakoo mountains, flowering in February.]

[*G. maxima, Kunth,*

According to SCHOMBURGK, occurs in the Canakoo and Tooarootoo mountains, and in the Humirida mountains, flowering in February and March.]

G. paniculigera, Mart: var microspatha, Spr. (sp).

LOCAL NAME.

Arawak..................................Dahlibanna-balli.

Leaves pinnate, or perhaps rather with several incisions penetrating to the rachis. It may be distinguished from the above mentioned *G. baculifera*, which it considerably resembles, by the smaller leaves, slighter but taller stem (9-10 ft. or more), round (instead of oval) seeds and smaller spathes.

My specimens were gathered on a creek which runs into the Corentyn river just behind the Timehri rock, where however it is not abundant. The various species of *Geonoma* run so confusingly together that it would be difficult without close examination to say certainly, but I am induced to think that this species is more common in the Pomeroon district than is *G. baculifera*.

[*G. Poiteauana, Kunth,*

Occurs, according to SCHOMBURGK, in moist woods on the Barima and Pomeroon, flowering in January and February.]

[*G. Spixiana, Mart*:

According to SCHOMBURGK, this occurs in the Canakoo mountains, and flowers from January to March.]

[*G. stricta, Kunth,*

According to SCHOMBURGK occurs in moist forests on the Essequibo, Pomeroon and Barima and in moist

spots on the savannahs, flowering from January to March.]

Anomalous Genus of Areceæ.

GENUS X. MANICARIA.

M. saccifera, Gaertn :

LOCAL NAMES.

Creole	Troolie.
True Carib	Tooroori.
Arawak	Timiti
Warrau	Ya-hoo-i.

Frond-entire, sub-entire or sub-pinnate, the pinnæ always (normally) connected by their apices.

This palm is extraordinarily abundant in the swamps, near the coast, between the Orinoco and the Pomeroon. From the latter river to the Essequibo, especially on the Ituribisci, it is fairly abundant. On the Essequibo itself it occurs on Troolie Island and in one or two other isolated spots. It appears to be fairly common on the Demerara. On the Corentyn we could not find more than a single plant, a young one, which was growing some distance up the Apoacka Creek, just below Orealla; another single, but older example is said by the Indians to have existed till recently near the same spot. Troolie is also said to grow in fair abundance, at the head of the Caboori Creek, a considerable tributary of the Corentyn.

This is the great thatch plant in the northern part of the colony, as the dahlibanna (*Geonoma baculifera*) is in the southern. It also appears to have been much used for the roofs of sheds on sugar-estates, until galvanized iron was adopted for that purpose. It is very durable and has been known to last twenty years. A

very large trade was done in the leaves, which were cut and brought to the side of the Pomeroon River by Indians and others. Small schooners, plying along the river, fetched them thence and distributed them throughout the colony. This trade still exists, but under much reduced conditions. The fruit is broken open by the Indians, who greedily drink the milk. This milk is said, by the creoles and black people, to be an unfailing remedy for cough and asthma. The Warraus make their 'fire-sticks,' with which they kindle fire by rubbing, from the mid-rib of the troolie leaf. The curious cloth-like spathes, shaped like fools-caps, are cut and sold as curiosities, and sometimes, it is asserted on rather doubtful authority, are seriously used as caps. I have seen the spathe also used as the bag of a landing-net by Indians when fishing.

TRIBE II. LEPIDOCARYEÆ.

["Leaves pinnate or fan-shaped, segments or divisions with the sides reflexed before unfolding. Spadix terminal or flowering amongst the leaves; spathes many, rarely one or few. Flowers hermaphrodite, monœcious or diœcious. Ovary completely or incompletely 3-celled, 3-ovuled. Fruit clothed with reflexed hard shining closely appressed scales; stigmas terminal.—Armed or unarmed palms, chiefly of the old world." HOOKER.

SUBTRIBE V.—MAURITIEÆ.

["Leaves fan-shaped. Ovary completely 3-celled.—Erect palms of the New World."—HOOKER.]

GENUS XI.—LEPIDOCARYUM.

["Flowers polygamo-diœcious, reddish in colour, fruit a one-seeded-berry covered by imbricating scales, leaves flabelliform, irregularly split, furnished at the margin with minute prickles; stem dwarf, a few feet high"]

[*L. gracile, Mart* :

According to SCHOMBURGK this occurs in 'moist forests, throughout the forest region' and in moist coppices in the savannah region, flowering in December and January.]

[*L. tenue, Mart* :

Occurs, according to SCHOMBURGK, 'throughout the forest region', flowering in February.]

GENUS XII.—MAURITIA.

["Flowers diœcious. Perigone, male, exterior short, 3-dentate or truncate, interior 3-partite, 6-androus, with erect anthers ; female 'exterior 3-dentate or 3-fid, interior 3-fid. Ovary 3-celled, surrounded by sterile stamens ; stigma 3-lobed, sessile. Berry large, 1-seeded. Albumen entire ; embryo near its base, or lateral.'—Arboreous palms ; leaves deeply palmatifid ; spadices simple, amentaceous, sessile, exerted from their spathe, distichous along the branches of the long, pendulous rachis, the internodes of which are covered with the sheathing tubular, subtruncate spathes ; flowers sessile, bracteate ; berry conelike from its loricate covering." Griesbach.]

[*M. aculeata, H b & Kunth*,

Occurs, according to SCHOMBURGK, in valleys in the Tooarootoo mountains and at the edge of coppices on the savannah, flowering in April.

Possibly a palm, apparently belonging to this genus, but of which I was never able to obtain either flower or fruit, which I have seen, more than once, on the Potaro River belongs to this species.]

[*M. armata, Mart* :

Occurs, according to SCHOMBURGK, on the upper Essequibo, up to 2,000 ft. above sea-level, flowering in February and in August.]

M. flexuosa, Lin:

LOCAL NAMES.

True Carib	...	...	...	Moreechi.
Arawak	...	...	...	Æta.
Warrau ...	...	...	...	Oheed
Macoosi ...	...	...	...	Gwy.

Measurements.—Height of aerial roots = 1 ft. 10 inch.; from roots to base of leaves = 54 ft. Girth above aerial roots = 3 ft. 5 inch.; ten feet higher = 3 ft. 11 inch.; at base of leaves = 3 ft. 6 inch. Length of leaf-stalk = 9 ft. 6 inch.; of pinnæ = 6 ft. 6 inch.; of fruit spike = 6 ft. 8 inch. Width of base of leaf-stalk = 1 ft. 10 inch; width between rings at ten feet from ground = 1 ft.: at top = 4 inch.

This, as it is the most useful, is also, probably, the most evenly and abundantly distributed of all the palms of Guiana, growing in every district. It grows in moist, rarely very wet, ground, chiefly in the so-called wet savannahs and swamps in the forest, and at the heads of creeks and places where the ground is thoroughly flooded only in the wet season. A good illustration of the inability of this palm to endure too much water at its roots is to be seen on the Tapacooma Lake, a natural 'wet savannah' which has been turned by artificial means, by the damming up of the water-courses which once partly drained it, into a permanent lake. This abrupt change in the character of the ground has affected the æta palms in a striking way. The plants grow gradually more unhealthy; the upper part of the stem, and the leaves and fruit, develop but very badly and in great disproportion to the stout and stately columnar stem which was formed at the time when water did not so constantly cover the ground; and at last the weak and puny top of the plant is broken off and blown away by some exceptional gust of wind, and

then the stately stem alone stands, the decaying monument of a once noble plant.

It is, as has been said, the most useful of all our palms; and, indeed, its real usefulness to man is so marvellously great as to have been exaggerated till it has lent the plant a certain historical interest. Father GUMILLA began the exaggeration when he ecstatically called the *Mauritia* 'the tree of life.' And HUMBOLDT, just for once making an unscientific use of his imagination, carried on the tale, and wrote :—

"In the season of inundations these clumps of *Mauritia*, with their leaves in the form of a fan, have the appearance of a forest rising from the bosom of the waters. The navigator, in proceeding along the channels of the delta of the Orinoco at night, sees with surprise the summit of the palm-trees illumined by large fires. These are the habitations of the Guarons (Warraus), which are suspended from the trunks of trees. These tribes hang up mats in the air, which they fill with earth, and kindle, on a layer of moist clay, the fire necessary for their household wants. They have owed their liberty and their political independence for ages to the quaking and swampy soil, which they pass over in the time of drought, and on which they alone know how to walk in security to their solitude in the delta of the Orinoco, to their abode on the trees."

The fact on which all this is founded is that the Warraus dwelt, and still to some extent dwell, not on living palms, but among these; and these palms are not the Mauritia, which seldom, if ever, grows naturally on the banks of large rivers where it would be visible to passing navigators, but the troolie (*Manicaria saccifera, Gaertn*:), which grows in the ooze at the riverside, almost as far as the edge of the sea. The main homes of the Warraus were probably, as they certainly now are, on some of the many small and isolated, but comparatively high, hills which occur, on the banks of

some tiny streamlet, hidden in the forest; but the temporary, or rather the occasional houses, which they used when they went down to the great river or even to the sea, to catch the fish or crabs which form their chief subsistence, were probably, as they still certainly are, among the troolie palms of the river, or sea-side, swamp. If the place was very swampy, these occasional houses, were built on piles, which raised and placed them among the not very lofty, but huge, living leafage of the surrounding troolie. And on the floors of these pile-dwellings fires were made, on hearths of clay; and the light from the fires, shining among the palm leaves—leaves almost the largest in the world---may well have gleamed with marvellous effect, broad blaze of light here sharply contrasted with great space of deepest shadow there, in the eyes of those passing navigators. It may be added that the floors of these dwellings raised among the palm-leaves were probably, as they now are, made of palm-stems, laid parallel to each other, not however the stems either of the æta (*Mauritia*) or the troolie (*Manicaria*), for both of these are too heavy to be used whole and too dense to be split for such a purpose, but the slender slight stems of the manicole (*Euterpe edulis*, *Mart*:) which grows intermingled with the troolie. But, again, if the ground on which these occasional houses are built is not sufficiently swampy to stir to the labour of erecting pile-dwellings, they are made in this other way; a number of troolies are cut, their stems, stripped of leaves, are laid, parallel to each other, on the mud, and over the floor thus formed the roof is raised. Mauritia palms, even if occasionally one or two of them grow near

enough to the river, are too valuable to be cut and used in this way; though sometimes where one of these has been cut for other purposes, perhaps for the sake of the sago or the wine which can, or at least are, only procured by the destruction of the tree, the fallen stem may be used, among the troolie stems, for the floor. Again HUMBOLDT'S quaint conception of the nets which he thought the Warraus hung from palm-tree to palm tree and used as hanging hearths and homes, was surely founded on a misunderstanding of some tale that was told him of how the Indians when resting, during their travels through the swamps, to place themselves out of reach of the rising tide, sling their hammocks, which may truly enough be said to be in itself an Indian's home, though not his hearth, high up in the trees.

But after all, though the Mauritia palm famous, owing to GUMILLA and HUMBOLDT, in history is thus but a myth, the real Mauritia, the æta of Guiana, has enough, and sufficiently varied, uses to make it not unworthy of its calling as the 'tree of life.' And to these actual uses we must now turn.

The leaves of the æta are occasionally, but not very frequently, used as thatch; but this only, as far as I know, by the Macoosis. The young leaves, just before they expand from the early spike-like form in which they develop, are shaken till the leaflets fall apart; these leaflets are then cut off from the leafstalks, gathered into small bundles, and laid on, as thickly as possible, much as straw is used for thatching in England.

A more important product is the fibre, which is also obtained from the young, spike-like leaves. Each leaflet is detached and treated simply. A sharp dexterous rub

with the fingers at the top detaches the outer skin, which is then entirely torn away. This outer skin forms the fibre; the rest is waste. The fibre is boiled, dried in the sun, and twisted, on the naked thigh, into string. Leaves from the younger plants are preferred for this purpose, those from older examples giving, it is said, a fibre wanting in durability. The string is used chiefly for making those most necessary of all Indian properties, hammocks, and is used for this purpose by the Arawaks and Warraus, who, however, make their hammocks in two different ways. Eleven or twelve full-sized leaves yield an amount of fibre sufficient for the largest hammock. The string, called tibiseri by the Arawaks, is occasionally, but seldom, used for other purposes also.

I have elsewhere pointed out that the preparation of string or thread, by thigh-twisting, from the fibre of the æta palm seems to have been the characteristic of the Arawaks, Warraus, and possibly of other 'native tribes' of Guiana, just as the preparation of string or thread, by spinning, from cotton fibre seems to have been the characteristic of all the Carib or 'stranger' tribes.*

As the leaflets, so the leafstalk, which when dried is extremely light and buoyant, is turned to a variety of uses. It is used by the Warraus, and the few creole squatters, toward the mouth of the Orinoco, for the shafts of the harpoons with which they capture fish and, especially, manatees. The leaf-stalks are also placed side by side to form walls and partitions in houses, by the creoles of the colony. The

* "Among the Indians of British Guiana," London, 1883 p. 287.

Macoosis occasionally raise three or four of the parallel fibres from the outer skin, for a distance of about three feet, their ends being left attached ; those fibres are kept away from the main-leafstalk by a bridge, like that of a violin, inserted under them at each end ; and the whole is then fastened upright on the tops of the houses, where the wind playing through the strings produces a very musical sound, like that from an Æolian harp. Sandals are cut, by the Macoosis and Arecoonas, who have to walk much on the often stony savannahs of their districts, from the tough outer part of the sheathing part of the leafstalk; and the strings which fasten these sandals on the feet are procured, as above described, from the leaflets of the same leaf. The pith of the leafstalk, tough and durable, is cut up and used in various ways ; cut into long lath-like strips, which are then fastened side by side like the laths of a 'venetian blind', it is made into very effective canoe sails. Smaller strips are made, by the creoles, into neat and often elaborate bird-cages. Stoppers for bottles are cut from the same substance.

The pith of the trunk itself is used, by the Warraus, as farine or sago ; and a tree having been cut down for this last purpose, a liquor much appreciated by the Indians, and really very palatable, is obtained from it in the following way : a hollow is scooped in the uppermost part of the stem as it lies prone, which hollow, having been protected from the sun by a covering of leaves, is found after a few hours to be full of sap, which presently ferments and forms a pleasant drink. It is said that sugar is occasionally prepared by the Indians from this sap. Moreover, when the felled tree begins to decay, the very large grubs of a beetle (*Calandra*) are found

abundantly in the pith, and are greedily eaten by the Indians and even regarded as a great delicacy by the older colonists.

The 'cabbage' of the æta is perhaps superior to that of any other palm.

The ripe fruit is largely used as food by the Indians, who, after scraping off the fir-cone-like scales, place the whole remaining part of the fruit in water, where, after a few hours, the fairly abundant yellow pulp round the seed becomes soft, in which state it is readily detached. Pressed into small cakes, this pulp has somewhat the flavour of rather strong cheese. A drink is also prepared by the Indians from the ripe fruit; but I am not sure how this is done.

TRIBE III. COCOINEÆ.

[" Leaves pinnate; leaflets with the sides reflexed before unfolding. Spadix flowering amongst the leaves; spathes 2. Flowers monœcious on the same spadix. Ovary 3, rarely 4-celled, cells 1-ovuled. Fruit 1—rarely 2—or more, celled and seeded, endocarp marked with as many pits as there were cells to the ovary, of which 2 cells are usually suppressed, and the third marks the position of the embryo in the fertile cell.—Armed or unarmed, almost exclusively new world, palms." *Hooker.*]

SUBTRIBE VIII. BACTRIDEÆ.

[" Spinous, usually slender, palms of the new world. Endocarp with 3 pores at or above the middle of the fruit." *Hooker.*]

GENUS XIII. BACTRIS.

[" Perigone male exterior 3-partite or 3-fid, rarely 3-phyllous, interior 3-phyllous; female exterior and interior urceolate, subtruncate or 3-dentate. Stamens 6—" 12." Ovary 3 (—1) celled, with 2 cells abortive: no 6—dentate cupule: stigmas 2, sessile. Drupe 1-seeded: putamen laterally 3-porous.—Trunk usually prickly along the leaf-sheaths; leaves often scattered, but chiefly approximate above, pinnatisect, rarely 2-fid—entire; spadix simply branched or simple, axillary; flowers sessile." *Griesbach.*]

B. acanthocarpa, Mart:

Var (or sp.?) crispata, Drude.

SCHOMBURGK gives *B. acanthocarpa, Mart,* as occurring throughout the forest region, flowering in December and January. My specimens, gathered on the Corentyn, sent to Professor TRAIL, that authority found to be DRUDE'S *crispata*. Whether the true species occurs in Guiana, or whether it is only represented by the variety here given I cannot say.

It is generally a slender, short-stemmed plant, much encumbered however with trash, growing, either singly or in clumps of two or three, on dryish ground, widely scattered through the forest. Sometimes, however, it grows in swamps, in which cases the stem is considerably more developed, occasionally attaining a length of ten feet, but being then almost always more or less recumbent. When growing in swamps there are always ærial roots; and when in other positions, a few of these, small and but little developed, are thrown out from one or more points some distance up the stem.

Leaves remarkably upright; leaflets few, about 28-30 on each side, cuspidate at the contracted apex, arranged sometimes in pairs, sometimes singly, at irregular intervals. Fruit clothed with minute prickles, round, orange-red when ripe, whitish just before; borne in *numerous*, very dense, grape-like clusters, many of which seem never to develop, apparently because too much crowded. Spathe usually curved over the fruit.

Measurements.—Height from ground to base of leaves = 2 ft. 4 in. Length of leaf 9 ft. Girth of stem 6¾ in.

The fruit is edible, but seems only to be picked, two or three at a time, casually by passing Indians.

[*B. aristata, Mart*:

Occurs according to SCHOMBURGK in the Canakoo and Tooarootoo mountains, flowering in August and September.]

[*B. concinna, Mart*:

Occurs, according to SCHOMBURGK, in the forest region, on the upper Essequibo and the Roopoonooni: in the sandstone region, at Roraima: and in the savannah region, on the Roopoonooni, flowering, in all these localities, in August.]

B. leptocarpa, SP. N. *Trail.*

(*B. campestri, Popp*: *affi.*)

A very tall species, often 20 ft., growing in clumps of two or three in swamps. Stem thickly clothed with gray spines, stoutish (in one we measured it was 8 inches at the thickest part, 12 inches about the centre). The whole plant has a great tendency to develop ærial roots, which are often long and dense, and grow from more than one point on the stem. Leaflets very broad and rigid at the apex, set at various angles to the mid-rib. Fruit, smooth, very small ($\frac{1}{6}$-$\frac{1}{8}$ in diameter), subspherical, whitish before maturity, then red.

This plant is extraordinarily abundant in very swampy places, in the forests, on the wet savannahs and along the river banks, from the sea up to the first falls.

A similar, but apparently slightly different species (or perhaps variety) called by the Warraus *Yaroowa* forms dense thickets along certain parts of the Barama, in the Pomeroon district, where, however, *B. leptocarpa*, Trail, is also very abundant and far more widely spread.

[*B. longifrons, Mart* :

On the banks of the Essequibo, according to SCHOMBURGK.]

[*B. macrantha, Mart* :

According to SCHOMBURGK this occurs in the Canakoo mountains, on the Roopoonooni and the Essequibo, flowering in January.]

B. major. Jacq :

= *B. chœtorachis, Mart* :

LOCAL NAME.

Creole (?)...Maswah.

Leaf regularly pinnate. Leaflets narrower and longer than in *B. megalocarpa*, Trail. Height of plant 10-15 feet. Fruit smooth, large (1½inch in diameter), oval, dull greenish purple.

The species grows abundantly, generally in somewhat dry, but occasionally in more moist, places, from the sea coast to some little distance up most of the rivers. On the Corentyn coast, between Skeldon and Tarlogie, it grows in immense numbers, sometimes, where it has been cut or burned down, forming dense banks entirely covering level, otherwise open, tracts of country. Up the Corentyn River it occurs in thickets along the banks to some distance above the "Second Hill," after which it is less abundant. On the Pomeroon it is very common on the low sea-tract, where mangrove is the prevailing vegetation, but does not occur higher up. On the whole, it seems not to penetrate beyond the tidal parts of the rivers ; though, according to SCHOMBURGK, it would appear to extend as far as the furthest limit of his forest tract *i.e.* to the Canakoo mountains.

At Orealla, on the Corentyn, this grows curiously intermingled with another, somewhat similar, species (*B. megalocarpa, Trail*).

I have seen a curiously malformed seed of *B. major*, which was found, and long treasured as 'obeah,' by a black field-labourer. It certainly was a curiously close natural imitation of a human head; the three pit-like markings on the seed had got into the position of eyes and mouth; in the centre of these the apex of the seed had developed into an abnormal ridge, well representing the nose; while the fibrous coating of the seed had been loosened, and had been lost except where a patch fairly represented the hair. Nor did the closest examination reveal that this seed had been tampered with by human hands.

B. minor, Jacq.

(= *Guilielma speciosa, Mart*:)

LOCAL NAME.

Creole (?)..Paripie.

Hardly a squatter's settlement, and even hardly any old established Indian settlement, is without its very beautiful and equally useful clump of this palm; and, as these settlements are often deserted and soon became entirely effaced, it is not very rare to see the paripie growing where there is now no human habitation. Yet the plant is not really indigenous in Guiana; indeed, I believe no place where it is certainly indigenous is known. It is much planted for the sake of its fruit, which, borne in large numbers, twice a year, form, when boiled or roasted, a most delicious vegetable, with a very pleasant chestnut-like, but somewhat bitter, flavour. The fruit is spherical, or in some varieties oval, about

the size of a pigeon's egg, generally free from any seed, and consisting then entirely of 'a farinaceous substance, as yellow as the yolk of an egg, slightly saccharine, and extremely nutritious.' The last words are quoted from HUMBOLDT, who writing of this palm, his mighty scientific spirit once more overcome by the enthusiasm to which he was subject, compared its fruit to peaches, and gave the plant the common name, which it has since familiarly borne, of peach-palm.

[*B. maraja, Mart*:

Occurs, according to SCHOMBURGK, in the Canakoo mountains and throughout the sandstone region, flowering in February and March.]

B. megalocarpa, SP. N. *Trail.*

This plant grows at Orealla, on the Corentyn River, intermingled with *B. major*, Jacq: which it not a little resembles, but from which it is certainly distinct.

Leaves interruptedly and irregularly pinnate ('at distinct intervals' notes Mr. JENMAN). Leaflets nearly on a plane with the midrib, rather broader than in *B. major*, Jacq; height of plant about the same (10–15 ft) but stem rather stouter. Fruit smooth, large ($\frac{3}{4}$ inch thick), but not so large as in *B. major*, nearly spherical, deep purple; ripe in October.

I have not seen the plant except on the Corentyn.

B. mitis, Mart:

LOCAL NAME.

Creole (Arawak ?).................................. Paripie-balli.*

* The name Paripie-balli seems, to me, to be applied indiscriminately to the two very similar species *B. mitis*, Mart: and *B. simplicifrons*, Mart.

Certain specimens of, as I thought, one small palm which we gathered on the Corentyn and sent to Kew were pronounced by Professor TRAIL to be "*B. mitis, Mart*: and *B. simplicifrons, Mart*: (with its varieties) intermixed." Not having MARTIUS' published description for reference, I am, therefore, unable to distinguish between the two. The following notes were made on the two species while I regarded them as varying forms of the same.

Fruit-bearing plants differ in height from 2 to (rarely) 6 ft.; the stem is very slender, somewhat stouter than a goose-quill. Leaves, sparsely clothing the stem, sometimes simple, sometimes pinnate—*the two forms sometimes occurring on one plant*. The bases of the leaf-stalks of the younger leaves have a very few, small and weak, black spines; otherwise the plant is unarmed. Fruits roundish, smooth, orange-red; borne on a simple spadix 2-3 inch long. Flowers in November. The plant grows, scattered singly or, at most, a very few at a time, among the very various plants which somewhat sparsely occupy sand reefs in the forest.

As regards the above description, it may be as well to point out that I am quite certain that, as I have stated in it, simple and pinnate leaves occur on one and the same plant; and that if any distinction between the two species here confused was based by MARTIUS on the respectively simple or pinnate characters of the leaves, this is untenable.*

SCHOMBURGK'S account of *B. mitis, Mart*: is that it occurs in the Canakoo and Tooarootoo mountains, and flowers in December. He thus overlooks the fact that the

* Mr. Jenman assures me that a truly and uniformly pinnate form is common at the Kaieteur.

plant certainly occurs, and frequently, in the coast tract.

[*B. pectinata, Mart*:

Occurs, according to SCHOMBURGK, in the Canakoo mountains, flowering in January and February.]

B. simplicifrons, Mart:

After referring to my notes on this plant given above in connection with *B. mitis, Mart*, I will here only add Griesbach's description of *B. simplicifrons, Mart*, in the hope that this may help to clear up the confusion between the two species. It is as follows :—

" *Wholly devoid of prickles, except on the margin of the leaf-summits ;* trunk low (3′-6′ high, the leaves included), arundinaceous : *leaves 2-fid, entire* : divisions oblong, curved-acute, broadly adnate at the flat base, diverging in an acute angle ; *spadix simple,* short, nodding ; inner spathe as long, glabrescent; drupe small, sub-globose. —Leaf divisions, 10″—12″ long, 2½″—3″ broad at the middle and at the base : prickles black, setaceous, 2‴—3‴ long: petiole 3″—6″ spadix 1″—2″ long, the latter shortly peduncled : drupe " red," 3‴ diam., with a truncate point.

SCHOMBURGK'S account of *B. simplicifrons, Mart* : is that it occurs on the Barima, Demerara, and on creeks, and flowers in May and June.

B. trichospatha, Trail.

LOCAL NAME.

Arawak. . . . . . Bunya-seri.*

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* *Bunya* is the name of a bird *(Galbula)* ; *seri* seems first to mean anything pointed, as a spine, and then to mean 'a spine-bearing plant' : cf., as regards this extension of meanings, our local word 'pimpler' and also the English word ' thorn,' which both mean either a prickle or a plant bearing prickles.

Fruit, smooth, roundish, dark-purple, about the size of a large pea, borne on branched spadices.

This plant is very common on the Corentyn and its creeks, growing in clumps in many places along the river, and in the forest under the shade of the trees. It appears in very distinct forms in the two places. When growing in exposed places, near the river, it is shorter (8–10 ft.) and slightly stouter ($4\frac{1}{2}$ inch) in the stem; it also then has more spines, and more numerous and broader pinnæ. When growing in the shade it is taller (up to 20 ft.), the stem is much slighter, and is almost denuded of spines; the pinnæ are very few in number and narrow. The leaves of the two forms are however, otherwise, alike; and the fruit is identical. The fruit, which was ripe in October, is edible, but not much used. The stems of the plant would make excellent walking sticks.

I have not seen the palm elsewhere than on the Corentyn.

GENUS XIV. DESMONCUS.

[" *Perigone* exterior small, sub-truncate or 3-dentate, interior male 3-phyllous, female urceolate, sub-truncate. Stamens 6. Ovary 3 (—1) —celled, with 2 cells abortive: no cupule of abortive stamens: stigmas 3, terminal. *Drupe* 1-seeded: putamen 3-porous at the summit.—Stem arundinaceous, scandent, prickly; leaves scattered: rachis produced into a cirrhose extremity, with its segments transformed into hooks: petiole sheathing: spadix simply branched, axillary, flowers sessile: drupes small."—GRIESBACH.]

[*D. macrantha, Mart*:

Occurs, according to SCHOMBURGK, throughout the forest region, where it flowers in January and February; and in the sandstone region, in forests and on the Humirida mountains, where it flowers in November.]

[*D. mitis, Mart*:

Occurs according to SCHOMBURGK, on the upper Essequibo in the Canakoo mountains, and also in coppices and at river-side in the savannah region, flowering in both places in January and February.]

D. palustris, Trail.

LOCAL NAMES.

True Carib......................................Kamwarri.
Arawak...Wha-hey-eu.

Fruit oval, bright red (like the 'cherry' of the coffee), larger and more transparent looking than in the following species.

Frequent in deserted lands near the coast, this plant occurs in the forests along the river banks, not very abundantly but widely scattered. It is perhaps most abundant in the Morooka, and the neighbouring rivers, where it takes almost complete possession of the more swampy clearings.

Pieces of the stem of this, as of the following species are used by our Indians as 'ribs' or strengthening pieces in their pegalls (baskets) and also for the framework of their cassava strainers.* The Creoles also make very strong baskets of the stems of this palm.

D. polyacanthus, Mart:

LOCAL NAME.

Arawak...Kamwarriballi.

A more slender plant than the last species. First hardly so large and slightly more oval; red also,

* Wallace says that this plant is preferred by the Indians of the Amazon as material for their 'matapies' or cassava *squeezers*, as being most durable. But that use seems to be unknown to our Indians, who use for that purpose 'moocro' stems (*Ichnosiphon.*)

but with a more dull, less transparent look. Flowers chiefly in November.

This is used for the same purposes as is the last described species. Its split stems are used by the Indians to bind the blades of their knives into the handles.

[*D. setosus, Mart* :

Occurs, according to SCHOMBURGK, on the Canakoo mountains, flowering in January.]

GENUS XV. ASTROCARYUM.

["*Perigone* of *Bactris*, female flowers distant from the amentaceous male ones. Stamens 6 (" or more"). *Ovary* of *Bactris* : stigma 3-lobed. *Drupe* of *Bactris* : albumen hollow in the centre.—Trunk annulate prickly, rarely none; leaves *rosular at its top*; spadix *simply branched* : male flowers *in the contiguous alveoles of the ament, female flowers either distant below them, or inserted in the rachis* : spathe *prickly*." GRIESBACH.]

A. aculeatum, Meyer.

This species, and indeed the genus, seems to have been founded by G. F. W. MEYER, and first published in his *Primitiæ Floræ Essequeboensis**. It has, therefore, a certain historical interest, as the first member of an important genus. The species seems to be accepted by excellent authorities, and is, therefore I presume, valid. At the same time, the *Astrocaryums* of this section—for *A. gynacanthum,* Mart :, *A. Munbacca,* Mart :, and *A. plicatum,* Drude, to mention only species of British Guiana, may be regarded as forming a different section of the same genus—run together so closely, and are so hard to distinguish, that there is still a possibility of error in the establishment of this species. And two

* Gottingen, 1818. p. 267.

facts mentioned by MEYER seem slightly to suggest that there has been some such error. He writes that it occurs 'in forests by the Aroabisci Creek' [in sylvis circa rivum *Arowabischikreek*]; and also that, 'he thinks, he has known the fruit under the name of Aguire' [Fructum, nisi fallor, sub nomine Aguire vidi]. Now, the only Astrocaryums of this section which seem to be present on the Aroabisci Creek are *A. tucuma*, Mart: *A. tucumoides*, Drude, and an intermediate form between these two locally known as *Arapeepi*. Of these the one known throughout the colony as *acque-ero* (which evidently is the same word as the *Aguire*) is *A. tucuma*, Mart: or, as Professor TRAIL suggests, a variety of *A. tucuma*, Mart. It may be fairly assumed, therefore, that the *A. aculeatum* of MEYER is not the palm here known as acque-ero (or aguire). It is, however, just possible that it is that very similar form to acque-ero which is locally known as arapeepi, of which I have not as yet been able to secure any botanical determination.

SCHOMBURGK, it should be added, represents the *A. aculeatum* of MEYER as growing on the lower Essequibo and flowering in August and September.

A. gynacanthum, Mart:

This occurs, according to SCHOMBURGK, in the Canakoo and Humirida mountains, flowering in October and November. I know nothing personally of this type form, which is represented in the more accessible parts of the colony by its variety *Munbacca*, Mart., which variety, however, Martius regarded as a separate species.

A. gynacanthum, Mart:
(*var. Munbacca Mart:* (*sp*).)

LOCAL NAMES.

True Carib..Weeri.
Arawak ....Aroacooshi.*
Warrau..Hee.

This palm is to me the most familiar representative of what may be called a second section of the genus *Astrocaryum;* the other section being best represented by *A. tucuma, Mart.* The differences are possibly rather such as readily catch the eye of one seeing the whole plant than such as admit of botanical description from herbarium specimens. The generally smaller size of the *Munbacca* section is a first mark. More important and effective is the angle at which the leaves in *Munbacca* and its allies stand out from the upright stem; this angle being such that the whole head of the plant may be very aptly described as 'umbrella-shaped'. In *A. tucuma* and its allies, on the other hand, the leaves are *very* much more erect. Again, in the *Munbacca* set the upper surface of the pinnæ is almost entirely in the same plane as the upper surface of the mid-rib. In the *tucuma* set, on the other hand, the much weaker pinnæ curve away from the mid-rib almost immediately. Lastly, though this character does not seem to me quite so well ascertained, the spines seem to be set on the stem in the *Munbacca* set more regularly, and in very narrow rings separated from each other by wide bare spaces, rather than in deep and almost contiguous bands

* Aroacooshi: 'tiger's eye'; *Aroa* is the Arawak name for the jaguar or 'tiger,'; *cooshi* means 'eye.' The name of another plant, I am not certain what it is, is *Haimara Cooshie*, i.e. the eye of the haimara, a well-known fish *(Erythrinus)*.

as in *A. tucuma*. *A. plicatum*, Drude, which will presently be described, represents in some respects an intermediate form between the two sections, approaching *tucuma* in the 'shuttle-cock,' or erect, arrangement of its leaves, but in most other points more nearly resembling the *Munbacca* set.

Measurement.—Height to base of leaf-stalk= 15 ft * ; girth of stem at 5 ft. from ground = $7\frac{1}{2}$ inch. at base of leaf-stalk = $8\frac{1}{4}$ inch. Length of leaf = 6 ft. 3 inch. of leaf stalk to lowest pinnæ = 1 ft. $8\frac{1}{2}$ inch. Breadth of leaf 3ft. 2 inch. Length of longest pinnæ $3\frac{1}{2}$ inch.

The fruit is smaller than in any other of the Guiana species, is yellow in colour, and is ripe in the first quarter of the year. When ripe it bursts, to allow the nut to drop out, in a curious way. The fleshy covering of the fruit splits and folds back so as to form a four-pointed star, which remains adherent to the rachis, while the nut drops to the ground. I do not know that any of our other palms has, as this thus has, a dehiscent fruit.

This species is allied, among those of the genus *Astrocaryum* of Guiana, to *A. plicatum*, Drude, by the fact that in both the fertile flowers are on the main rachis, the barren on branch raches; but it differs from *A. plicatum* in that its fruit is smooth, instead of prickly as in that species. On the other hand it differs from *A. tucuma*, Mart, *A. tucumoides*, Drude, and the others of that section, all of which also have smooth fruits, in that round the base of its fruits there is a ring, or involucre, of broad, flat, dark-brown hairs or prickles.

A. Munbacca grows under the shade of the forest in moist, but not swampy, places, and is widely distributed throughout the coast and forest tract. The stem is very

* This was the height of an average specimen ; but the variation in this point is very considerable in this species.

upright; and two or three sometimes grow close together, so that they form almost one clump.

The ripe fruit is eaten and much relished by Indians.

[*A. Jauari*, *Mart*:

According to SCHOMBURGK, this occurs in the Canakoo mountains, throughout the sandstone region, and, in the savannah region, on the Pirara, Ireng (Mahoo) and Takootoo rivers, flowering from October to December.]

A. Murumuru, *Mart*:

[This occurs, according to SCHOMBURGK, throughout the forest and sandstone regions, flowering in November and December.]

A. plicatum, *Drude.*

LOCAL NAME.

Arawak...Kareea.

Measurements.—*Height* of stem =25 ft. 6 inch: of aerial roots = 1 ft. 6 in.: of bare part of stem above aerial roots = 9 ft. 5 inch. *Girth* of aerial roots at ground = 3 ft. 8 inch: of trunk above aerial roots = 1 ft. 7 inch: of trunk at ten feet above the ground = 1 ft. 10 in. *Length* of leaf = 18 ft. 7 in., *Breadth* of leaf = 5 ft. 5 in.

A very striking species of *Astrocaryum*, with a very black and grisly appearance, due to the dark colour of the whole plant and to the length and abundance of the spines.

Unlike any other *Astrocaryum* of Guiana, the sheathing portions of the leaf-stalks are very persistent after the leaves themselves are dead and gone; indeed in many of the lower, but mature plants, these trash-like, dead leaf-stalks entirely clothe the whole stem, which

thus appears very thick. But in the taller plants, in which part of the stem is bare, it is evident that the trunk is really slender, especially just above the aerial roots, from which point the girth increases gradually up to where the trash commences, from which point, of course, the girth, or diameter, owing to the shuttle-cock-like arrangement of the leaf-stalks, increases rapidly up to the tops of the somewhat erect leaves. Unlike any other *Astrocaryum* known to me, the stem is apparently unarmed, for when the leaf-stalks have dropped away, revealing it to sight, it is found quite devoid of prickles. Possibly, however, as the leaf-stalks are so long adherent the spines decay before the stem becomes exposed.

The fruits, which are densely covered with small prickles, are probably normally oval in shape; but these are so densely set on the main rachis as to alter their shape irregularly. The whole spike is, in fact, shaped somewhat like a pine-apple; and each of the fruits is forced by the pressure of the others surrounding it, into the shape of the drupe of the pine-apple. In the mature seed, therefore, the upper end—that which was furthest from the rachis—is rounded; but the opposite end—that by which it was attached to the rachis—is elongated and pointed, the sides between these two ends being flattened.

This palm grows, singly, in the forest, in large numbers, on both sides of the Cabalebo river, a tributary of the Corentyn, and is especially abundant at the mouth of a small creek, called "Grindstone Creek", which runs into the Cabalebo. It also occurs on the main Corentyn river near Orealla, but on the Dutch side. I have never seen it elsewhere in the colony.

A. tucuma, Mart: var?

LOCAL NAMES.

True Carib....................................Tucumou.
Arawak............................... ....Acque-ero.

This and the following species (*A. tucumoides*, Drude) resemble each other closely in general character, yet differ, chiefly, and greatly, in size, and in habit of growth—one producing only a single stem while the other produces several to each plant—the same distinguishing characters in fact that the rayhoo and manicole separately exhibit. It will be well to give the measurements of the two in the following form, in which they may readily be compared.

	A. tucuma, Mart: *Single stem.*			A. tucumoides, Drude. *Several stems.*	
	ft.	inch.		ft.	inch.
Height of stem	37	0		33	0
Girth ,, at root...	2	6	...	1	11
,, ,, half way up	2	3	...	1	8
,, ,, at top ...	2	9	...	1	8
Length of leaf to lowest pinnæ	6	6	...	6	3
Length of leaf from lowest pinnæ to top ...	17	0	...	11	6
Breadth of leaf at broadest	8	0*	...	6	0
,, pinnæ ...		2½			
Length of spathe... ...	9	8	...	7	0
,, spike (rachis)	9	6	...	6	10
Breadth of spathe ...		8			
Length from base of rachis to lowest branch ...	4	8			

Fruit smooth, larger than that of *A. tucumoides*,

* The longest pinnæ equal 4ft. 6ins.; but these stand at such an angle to the mid-rib that the whole breadth of the leaf is but, as above given, 8ft.

terminating in a more acute point, in colour a lighter and purer yellow, with a less fibrous fleshy covering. Ripe in November to January. The stem, except when the plant grows in exposed places, when it becomes bare, is densely clothed with enormous, flat spines arranged in bands varying in breadth individually (*i.e.* each band varying in breadth on different aspects of the tree) and varying also in breadth the one from the other.

The spines vary in length, and are set in different directions, the longest downward, some of the shorter upward.

The leaf-stalks, which clasp half round the stem, but are not sheathing, are densely clothed as far as the lowest pinnæ with spines, which gradually decrease in size, the longest being nearly as long as those on the stem. Above the lowest pinnæ the spines are fewer, and are confined to the lower side of the midrib, but some are present even to the very top of the leaf. The leaves start from the stem in a very upright direction; but from a point about halfway between the base and the lowest pinnæ they curve very gradually outward.

The spathe is long, but very narrow; the outer side densely clothed with bristles, among which are scattered a few small spines.

The trees stand singly, but several are often grouped near together in some special part of the forest, not on the river banks, but generally not far from the river. It grows throughout the colony.

Where, as is often the case, this palm has obtained a hold in cultivated and partially cleared, sandy ground, it is gregarious and springs up in immense numbers, as does *A. tucumoides* in the same way, and chokes out almost all other vegetation.

The ripe fruit is greedily eaten by Indians and Creoles alike. A fine oil is also occasionally expressed from it. The Indians sometimes make the fans which they use to blow up their fires, of the young leaves of this palm, though more often of those of *A. tucumoides*. The wood has been used with fine effect in inlaid wood-work. It also is made into beautiful, but somewhat fragile, walking-sticks.

A. tucumoides, Drude.

LOCAL NAME

Arawak .... Awarra.

Resembling *A tucuma* (under which see), but smaller in all its parts.

The fruit is smoother, smaller and somewhat rounder (?) than in *A. tucuma*, with a more fibrous fleshy covering; in colour a deep red-orange. Ripe chiefly in January and March.

The stems are erect, but not so much as in *A. tucuma*, as they must necessarily diverge somewhat to make room for the several heads of foliage. The spines too are smaller, the leaves more erect.

The male and female flowers, as in *A. tucuma*, are both on branches of the rachis.

The plant grows, occasionally singly but more generally in small clumps, and is found throughout the colony.

The fruit is much eaten, but, being more fibrous and with a less amount of flesh, it is not so good as that of *A. tucuma*. Oil, of a beautiful red colour, is sometimes expressed from them both. The fans used by the Indians for blowing up their fires are plaited usually of the pinnæ

taken from young, unexpanded leaves of this palm. The fibre of the growing unexpanded leaves is largely used by the Brasilian Indians, though not much in this country, and is unusually strong and durable.

There are various other species of Astrocaryum more or less closely resembling these two, *A. tucuma* and *A. tucumoides.* Of these one seems an exactly intermediate form between the two; this is called by the Arawaks *Arapeepi,* and may be, possibly, *A. aculeatum* of MEYER or, more probably, an undescribed species. Another, which grows in immense numbers, and in dense thickets, in sandy places on the banks of most of the large rivers, in their upper waters, is called by the Caribs *Souari.* This last is at once distinguishable by the strange, grayish-green appearance of the whole plant; and the leaves are more erect, and proportionally smaller, than in any of the other species. The fruit is smooth, smaller even than that of *A. tucumoides*; and it is said to have 'a slimy rather than a fleshy covering,' so that it is never eaten.

[*A. vulgare, Mart*:

Occurs, according to SCHOMBURGK, throughout the coast, and also the sandstone region, flowering in January.]

GENUS XVI. ACROCOMIA.

["*Perigone* exterior and interior 3-phyllous; female flowers distant before the amentaceous male ones. *Stamens* 6. *Ovary* of *Bactris,* but surrounded by a 6-dentate cupule: Stigmas 3. *Drupe* 1-seeded: Putamen 3-porous about the middle. Trunk *arboreous, densely prickly; leaves rosulate at its summit*: petiole *and* rachis *prickly*; spadix simply branched; male *flowers in the contiguous alveoles of the ament female distant, sessile along its peduncle.*" Griesbach.]

[*A. sclerocarpa, Mart* :

This, according to SCHOMBURGK, occurs in the Canakoo mountains and, in the sandstone region, in forests, and on the banks of the Kukenaam river, flowering in June and July.]

A. lasiospatha, Mart :

LOCAL NAME.

Arawak..Yawarra.

Measurements.—Height to base of leaf-stalks = 37 feet. 6 in.; Girth of stem at ground = 3 ft. 10 inch: half-way up = 2 ft. 6 in: at top = 2 ft. 3 inch. Length of leaf = 8 ft. 8 inch. Breadth of leaf = 3 ft. 6 inch. Leaf of pinnæ = 2 feet. 1 inch. of rachis = 4 ft. 3 in.

A few aerial roots. Spines deciduous on trunk but persistent on leaf. The most recent leaf stands upright in a very bold way, the rest are very much curved; so that the whole head of the tree has a globular outline.

Fruit large, round, compressed, yellow. Spathes very long but narrow, without prickles but rusty-villous. Leaflets very narrow, almost linear.

The trunk, in the specimens measured, was not swollen in any part, but gradually decreased from the base upward. *A. lasiospatha* of Martius is, however, said to have a 'ventricous middle part.'

This is by no means a common palm in the colony. A large group crowns the "Second Hill" on the Corentyn river. The hill on which stands the old settlement of "Peerboom" on the Berbice river also has a large number of Acrocomias on it which probably belong to this species. And it is said to grow at Hitchia, and also at one or two other spots, also on the Berbice. I do not know it elsewhere.

GENUS XVII. MARTINEZIA.

[" Distinguished from Acrocomia by sessile, not amentaceous male flowers." Griesbach.]

[*N. caryotæfolia, Humb.* & *Kth* :

This is said by SCHOMBURGK to grow 'throughout' the forest region, and, in the sandstone region, on the Kukenaam river, flowering in September and October. It seems, however, to be confined to quite the furthest parts of the forest and sandstone regions.]

SUB-TRIBE VIII. ELÆIDEÆ.

[" Unarmed palms of Africa and America, endocarp with 3 pores above the middle of the fruit." *Hooker.*]

GENUS XVIII. ELÆIS.

[" *Flowers* monœcious, male and female in distinct spadices, sunk into alveoles. *Perigone* exterior and interior of distinct leaflets *Stamens* 6, monadelphous. Ovary 3-celled : stigmas 3. *Drupe* 1-(-3) seeded : putamen 3-porous near the summit. *Albumen* hollow in the centre.—Arboreous palms ; trunk unarmed but covered *with spiny persistent petioles ;* Spadix *simply branched ;* branches *conglobate,* amentaceous." *Griesbach.*]

[*E. melanococca, Gaertn :*

Occurs, according to SCHOMBURGK, on the upper Cuyooni, flowering in May.

The other species of Elæis (*E. guineensis,* Jacq :) somewhat abundantly naturalized in one or two spots on the coastlands, is an African species and, of course, merely an escape from cultivation.]

SUB-TRIBE IX. EUCOCOINEÆ.

[" Unarmed palms of the New World. Endocarp with 3 or more pores towards the base, except Jubæa." *Hooker.*]

GENUS XIX. MAXIMILIANA.

[" Character of Cocos (i.e. *Perigone* exterior and interior 3-leaved. Stamens 6, included. Ovary 3 (-1)-celled: Stigmas 3. *Fruit* woody, 1-seeded: putamen 3-porous at the base, 3-cristate at the summit. *Albumen* hollow. *Spadix* simply branched), but fruit drupaceous, with a smooth, pointed putamen.—Flowers approximate, male amentaceous, female few, below the former." *Griesbach.*]

M. Martiana, Karst:

(= *M. regia, Mart.*)

LOCAL NAMES.

True Carib (and Macoosi)........................Mareepa.
Arawak..Kokeritè.
Warrau...Doe-è.

Measurements.—Flowering part of spike = 2 ft. 4 inch. Leaf to lowest pinnæ = 11 ft.; from this point to top = 24 ft.

In most parts of the colony, except perhaps on the immediate coast land, this is the commonest palm, varying, however, considerably in height. On the Corentyn, where it is very common, it is very tall; while in some parts of the swamp-lands of the Pomeroon district, in which particular place it is comparatively rare, it has generally no stem.

In all stages of its growth it is a very striking plant. When young, before the stem is developed, its few, but most noble, leaves rise almost straight from the ground, only their tops curving, and the whole recalling to the dweller in the tropics, stateliness of the grander specimens of 'Irish yew' at home. And when, at a much greater age, its stem has developed to a great height, it is still the grandest of all our palms. Part of its stateliness—I cannot help harping on the word, for it expresses the character of the tree, is lent it, at this stage of its existence, by the fact that the bases of the old and withered leaf-stalks, and also the withered flower-spikes

and the spathes remain long persistent. Where the tree stands in exposed places, the older and lower leaf-stalks do fall off, but it is only to leave exposed the grandest column-like stem that ever palm had; and this column is surmounted by a vast capital of massive and magnificently curved spathes, some old and dead but strong, some as yet unexpanded or but just expanding to show the yellow flower spike, but all joined and harmonized by an adventitious growth of ferns and creeping plants. Or if the tree stands in sheltered places, where the blasts of the wind cannot detach the bases of the old leaf-stalks, then the stem is clothed with these throughout its length, and the whole stem affords root-hold for ferns and other epiphytal plants. And in this latter case, the regular, spiral arrangement of the leaves on the stem is very evident and striking.

The leaflets, too, are set on to the midrib of the leaf in small groups, at such, various, angles that the whole leaf has the outline and beauty of a curled, rather than of a natural, ostrich plume.

Probably after the Æta (Mauritia) the kokerite is the most used of all the palms of Guiana.

In times of scarcity, the Indians live almost entirely on the pulp, little enough, of the fruit of these palms; and after even that has been consumed, they regather the seeds which they had cast aside, break these open, and devour the kernels; or the seeds are laid aside in a heap, when they breed plentifully a maggot of which the Indians are fond, similar to in character, but smaller than the better known gru-gru worm. Even in times of plenty the fruit is sought and eaten as a luxury. Indeed, this fruit, or rather its pulp, really has a not unpleasant,

somewhat acid taste ; so much we may readily admit, without consenting with HUMBOLDT who, having declared the fruit of the Mauritia to be of taste like an apple and the fruit of the 'parapie' (*Bactris minor*, Jacq : = *Guilielma speciosa*, *Mart*) to be as that of the peach, surpassed these too enthusiastic and eccentric utterances by likening the fruit of the kokerite (*Maximiliana*) to that of the sunny sweet apricot.

The leaves are largely used for thatch, in places where neither the troolie palm (*Manicaria*) nor the dealbanna (*Geononia*) are to be had for that purpose. The young, as yet unexpanded leaves are selected for this purpose, and are shaken, till the leaflets fall apart, after which the whole leaf is ready for use as thatch.

The large and woody spathes are often used by the Indians as vessels for holding liquids or cassava meal; and in these spathes liquids are sometimes even boiled. Children, too, use them, as boats, in which they paddle about on, or even cross the rivers.

From the midribs of the leaves are formed the darts to be expelled from the blow-pipes ; and from the same material are sometimes even fashioned small arrows used for shooting the fry of fish.

GENUS XX. ATTALEA.

[" Character of Cocos" (see under genus Maximiliana), " but nut 3 (2-5)-celled, 3 (5)-porous at the base : putamen rugose." *Griesbach*.]

[*A. funifera*, *Mart* :

Occurs, according to SCHOMBURGK, in the Canakoo mountains, flowering in November.]

A. speciosa, Mart:

Occurs, according to SCHOMBURGK, on the Essequibo, Corentyn and Roopoonooni, flowering in November and December.]

GENUS XXI. ORBIGNIA.

O. Sagotii, SP. N. *Trail*:

LOCAL NAME.

Arawak..Kooreea.

Macusi..Oorooà (?)

Measurement.—Length of leaf = 25 ft. 6 inch; do. to first pinnæ = 5 ft. 10 inch.

This stemless, but large-leaved, palm grows near the mouth of "Grindstone creek" on the Cabalebo Creek, a tributary of the Corentyn. A very similar, possibly identical palm occurs near, and gives name to, the Oorooa rapids, on the Roopoonooni river, a far distant tributary of the Essequibo.

The fruit, spadix and the spathe are very similar to those of the kokerite (*Maximiliana*), but are, as regards the last two parts, *much* smaller, while the fruit is somewhat larger *i.e.* broader. The leaves, however, differ greatly from those of *Maximiliana*, in that the pinnæ, instead of being set on at various angles, are arranged in one plane with the midrib.

On the Roopoonooni the Indians weave the leaflets of their palm (which, as I have said, is probably of this species) into pegalls (baskets) of peculiar character.

The Berbice River: and an Analysis of some of its Soils.*

By the Hon. B. Howell Jones.

SO much has been written about the Berbice River and descriptions of the scenery along its banks that it may appear superfluous and conceited on my part to attempt to give any further information about a river which I have visited only once, and that for the short space of only one week; but anyone, I venture to think, who has visited that district cannot but wonder why such a beautiful river of the colony has not become more thickly populated and the land brought under cultivation, and it is only by making a careful examination of its soils that this to some extent becomes apparent. I am not now speaking of that portion of the river adjacent to its mouth on which are situated the fine sugar-estates of *Providence*, *Highbury*, *Friends*, *Mara,* and *Ma Retrait*, but of that section lying between the old Dutch town of Fort Nassau and the Etoony downs.

At the first named place a stranger notices the banks of the river rising a few feet from the level of the water; and, on landing, a sharp rise brings you to the remains of this once fine settlement, now a mass of crumbling brick work, overgrown with bush and creepers, and it is curious to see the lianas which have forced their way through the crevices of the brick work, enclosing some of the bricks in their embrace, still retaining their hold,

* This paper was read at the meeting of the Society held on the 12th June, 1884.

and carrying the bricks far over your head and their former position. Some of the brickwork, and right good work it was, done by these old Dutch masons, still retains its lines, this being especially noticeable in the arches of a bridge spanning a small rivulet in the main thoroughfare. The visitor cannot but be attracted by the gigantic stems of the cabbage palms, straight as if plumbed with a line, carrying their plume of leaves high above the surrounding forest. The nature of the upper surface of the soil here is of course entirely artificial, the refuse and accumulation of a deserted town covered with a few inches of vegetable mould; but the careful observer will have noticed, on landing, the tenacious nature of the clay on the edge of the river. Proceeding farther up the river to Pln. *Friendship*, where Mr. PATOIS has a fine house, situated on the shelving bank of the river, this clay is almost white on the surface; hard and unfertile soil it looks in dry weather, in the rainy season assuming great tenacity and glueiness, making it very slippery to walk upon. Notwithstanding this, a few fruit trees are scattered here and there, which would thrive better if the great enemy the cooshie ant would give them an opportunity. A few steps behind the house brings you to a steep rise of about 100 ft., and whilst making the ascent, the stiff clay gradually becomes mixed with sand until the top is reached, when the clay has disappeared, giving place entirely to pure sand covered with decayed and decaying leaves from the trees, which extend for a hundred yards or so, until the open savannah is before you. A pretty sight it is and refreshing to the eye of those accustomed to the flat coast lands to see the undulating down stretching away for miles, dotted here and

there, where moisture has accumulated in a hollow, with clumps of large handsome trees; and the stranger wonders why this land is not covered with homesteads, with their flocks of cattle and sheep, like unto their own country. But, stop;—examine what we are standing on,—pure white silicate; scrape it with your foot, plunge your stick deep down into it, for you will find it loose enough, feel the heat on the surface with the palm of the hand and you begin to wonder how it is that anything green grows on it; now examine the growth,—grass of the coarsest description, growing in tussocks, most of it razor-grass, sharp and keen at the edge, as you will find it your bare leg comes in contact with it. Examine closer and you will find a few blades of fresher and sweeter grass growing under the shade of its coarser brother, on which the few head of cattle belonging to Mr. PATOIS eke out a subsistence; poor miserable cattle they are, notwithstanding the miles of country over which they are free to roam. Inter-breeding no doubt accounts for a great deal of this; but the feeding is such that you could never expect to rear cattle to compete in the food markets of the world. Whether this feeding ground could be improved by burning off the coarser kinds of grass and allowing the sweeter kinds to grow as is done in Australia, is to my mind very doubtful. I do not say a great deal might not be done by experienced ranch men with capital, pluck, and knowledge, but I do not think this class of men will come here as long as the vast areas of land in America, Australia, and Canada, with their more suitable climate for the white man, lie open before them. But we must pass on. This which we have been gazing upon is only one of the small

savannahs, and the river banks still require exploring.

Let us stop at Doornboom, an old cocoa estate, a property the title of which is in dispute but claimed by the Government. Cutting our way through the under growth we notice a small water-course, the angle which it makes with the river being the boundary of the estate and forming the main drainage channel into which the small drains, now almost obliterated were led, thus securing perfect drainage at a minimum cost. Look at the soil, it is much the same as that we saw at *Friendship*; but you will see cocoa trees growing most luxuriantly, neglected straggling trees, unpruned, uncared for, and to a cocoa planter's eye unprofitable, but, notwithstanding all this neglect, bearing on their branches a few large pods. Two varieties of cocoa were grown here, as you will find both red and yellow pods, though there are few of the former. From what I saw I cannot imagine a better site for a cocoa estate, only labour being wanted to bring it back to its former productiveness. Shade, which the cocoa loves, is already there; and with seed at hand for planting, the under-growth only requires clearing, and time with industry would soon bring it back to cultivation. *Monte Video* on the right bank of the river is the next place to visit, a property belonging to the Berbice family of DUGGIN. On landing, the taste of one of its former owners is seen in the fine fruit walk planted at the water side, prominent amongst which are to be noticed the tall breadfruit trees, rising to the height of 50 to 60 feet. Ascending the steep incline, assisted by a brick step here and there, you pass through what was originally the coffee plantation, now of course neglected and overgrown with vines, until you reach the house,

almost tumbling down, inhabited by a tribe of pigs, the woodwork overhead infested with marabuntas and wood-ants. You can ascend the stairs if you are careful ; and it is a pity to see the remains of old books, pictures, etc., scattered about the floor and wall, a prey to damp and wood-ants. One picture especially strikes you, a view of the river in days gone bye, by some infant artist, and if ever the water was covered by the number of boats depicted, the Berbice river must indeed have been a gay place. Behind the house you find two splendid specimens of cocoa trees laden at the time of my visit with young fruit. The soil here, by the accumulation of house refuse, appears somewhat different to that which I have already described and to a slight extent less sandy and more impregnated with vegetable matter ; but a few yards from the house brings you again to the white sand, then through a small belt of trees to the same open savanna as exists at *Friendship*. In fact such is the formation of the whole of this district,—the river bank, a strip of sandy clay of greater or less width, then a belt of trees growing in sand, and lastly the sandy savanna. I need not land my hearers at each place. I stopped at *Maria Henrietta*, belonging to a Mr. GLADSTONE, and if any one wants to visit this district you cannot do better than write to him and he will find you accommodation for hanging your hammocks, provide boats, and act as guide. We also visited *Landstroon*, where an American has started a cocoa plantation, eking out an existence until his crop commences to give him a return, by growing ground provisions, bartering small goods with the Indians for gums, tonka beans, etc., and keeping a small store. Analyses of the soil from these two

places are given in the appendix to this paper, and the great similarity of each of them is very apparent. One cannot leave this district without paying a visit to Coomacka, as I venture to think that here will be found some of the largest cocoa trees in the world; and my friend Mr. NIND, who accompanied me, is sure that there are none like them in Trinidad; not trees to suit a cocoa planter but wild, luxuriant overgrown specimens, samples of what a cocoa tree if left to itself in a suitable soil will grow to. Some of these trees, groups of gigantic stems, are from 50 to 70 ft. high, with branches extending 67 ft. and measuring at a distance 5 ft. from the ground, 9 ft. 5 in. in circumference. One single stem which we carefully measured had a circumference of 3 ft. 4 in. Few pods grow on these trees, but what there is of them, are large, of the yellow variety, containing an average of 40 beans. Looking over the analysis attached to this paper and which has been carefully made by Mr. ALEXANDER, the chemist at *Tuschen*, it will be apparent that this land is not suited to cane cultivation. In fact the stools of canes grown by the Indians close to their settlements do not look thriving; with ample room to spread, they look weak and the canes stunted; and on talking to those who have lived long in the district, such is the general opinion. Then comes the question, what has the new settler to turn to for a crop. Undoubtedly, cocoa and coffee. The former we have seen neglected, thriving and growing vigorously, not up to a cocoa planter's idea of thriving, that is, bearing large crops, but this would soon be corrected by pruning and cultivation; the latter the Berbice river has always been noted for, and a Ceylon planter

would I am sure be surprised if he saw the coffee trees growing wild round the Indian settlements, unpruned but still loaded with berries, growing in a soil which both to appearance and analysis seems utterly unfertile.

Now what are the chief causes why this land is uncultivated. Those that have seen the struggle for labour in the past easily account for this. Another reason is that as long as there is land easily to be obtained on the sea coast and near the large markets of the colony, you will not find men anxious to go away from their species, and from land which the first settlers of the country found more fertile than up the rivers, and which would grow a crop, sugar, which could withstand the high rates of wages ruling on account of scarcity of labour. We often hear the expression used "opening up the country;" that to my mind, and I think to the generality of persons, is a wrong expression to use. Opening up country, conveys to me the idea of pioneers taking to land which has not previously been under cultivation; now as regards this district and for at least 100 miles up this river, and similarly on the Demerara river, the land has not only been cultivated and surveyed, but the estates on both banks are in the hands of descendants of the original proprietors, or the present occupiers have purchased a right title and interest in the land. True, their claim would be difficult to prove, but I do not think any one would like to try and oust the present occupiers, and many would have a claim against the Government for compensation. Very little of this land is in absolute possession of Government, as was seen lately when the Government found it difficult to obtain a piece of land up the Demerara River on which

to build a magistrate's house and Court-room. Land granted only during Her Majesty's pleasure, of course could be claimed by the Crown; but I do not think any one need be uneasy on that score as long as our Attorney General thinks it safe to buy land held under similar grant.

As to the future of the Berbice river, I think one day it will be again under cultivation. It may be a long time and not many of the present generation living will see it, but when land becomes scarcer than at present, when labour becomes more plentiful, then we may expect some to turn their footsteps in this direction; and I know no field of labour better suited for our creole youths,—whose sole ambition now seems to be obtaining situations as dry goods clerks,—to turn their pluck and energy to and become landed proprietors cultivating coffee and cocoa.

APPENDIX.

Chemical Laboratory, Tuschen De Vrienden,
Demerara, 2nd Octr., 1883.

Hon. B. Howell Jones.

Dear Sir,—I have carefully analysed the four samples of Soil marked Maria Henrietta—Landstroon—Doornboom—Monte Video, from the Berbice River and find them to be of the following composition. I shall refer you to the samples hereafter as Nos. 1, 2, 3, & 4, in the order already named:—

	No. 1. per cent.	No. 2. per cent.	No. 3. per cent.	No. 4. per cent.
Water	1·303	1·252	1·478	2·707
Organic Matter*	3·474	2·570	5·024	8·216
Silicious Sand	91·351	92·840	89·308	86·654
Alumina	2·421	1·964	2·726	1·620
Ferric Oxide	·860	·912	·892	·548
Lime	·091	·080	·102	·064
Magnesia	·072	·082	·051	·060
Potash	·050	·034	·028	·039
Soda	·068	·051	·021	·042
Sulphuric Acid	·085	·066	·082	·069
Phosphoric Acid	·054	·037	·063	·051
Chlorine	·061	·044	·037	·040
	99·890	99·932	99·812	100·110
* Cont'g Nitrogen	·046	·041	·071	·118

Experience, you say, has proved that these soils are better adapted for the cultivation of cocoa than for sugar cane. This is easily accounted for by the above analyses; they show that these soils are all of a dry sandy nature, therefore it is impossible for the moisture-loving sugar cane to grow upon them. Plants of a quick growth, such as the sugar cane, require that the mineral matters in a soil should be in a state of solution, so that they can be readily assimilated. The mineral matters in sand can only be in solution to a very slight degree, the lack of decomposing organic matter prevent their solution and the quick passage of rain through them washes out any soluble ingredients that may be present; such is the case with these sands, and the natural consequence is that canes fail to flourish there and hence the reason why they get so soon burnt up. On the other hand, the cocoa tree being of very much slower growth, has more time to assimilate the little nourishment it seems to require. Of the four samples I should think No. 4 must be the most productive; by the higher per-centage of organic matter it appears to have been longer in cultivation than the others.

I am, dear Sir, yours truly,

(Signed) J. OWEN ALEXANDER.

The Cultivation of Liberian Coffee.

By H. A. Alford Nicholls, M.D., F.L.S.

LIBERIAN Coffee was introduced into the West Indies from the Royal Gardens at Kew in the year 1874, when a few plants were sent by SIR JOSEPH HOOKER to the Botanic Gardens at Jamaica and Trinidad, and to the late Dr. IMRAY of Dominica.

At that time, Dr. IMRAY was endeavouring to re-establish the coffee cultivation in the island, but the devastations of the 'white-fly' blight—which had ruined the coffee estates forty years before—so far neutralised his efforts as to cause him well nigh to despair of success. It may readily be imagined, therefore, with what eagerness he watched the development of the young Liberian coffee plants, which, from the first, promised to be of a hardier nature than the Arabian or 'creole' species. They grew with wonderful rapidity, and, happily, they were not affected by the blight; so that, in a few years, the new Liberian coffee became thoroughly established in the island. Indeed, it would appear that Dominica is peculiarly adapted for the growth of this tree, for within the last few years many coffee planters in the various West Indian colonies, as well as the Botanic Gardens of Jamaica, Trinidad and British Guiana, have been supplied with large quantities of Liberian coffee seed gathered from the plants so carefully raised by Dr. IMRAY.

The cultivation of this new species of coffee has attracted considerable attention in all parts of the tropical world, and efforts have been made to establish the plant in most

of the West Indian colonies. This interest in the new cultivation will doubtless be increased, for the present crisis in the colonial sugar trade renders it necessary for many planters to look about them for new products, and those, who from choice or necessity decide to continue to cultivate the cane, will soon have brought home to them the wisdom of not depending entirely on the culture of one staple. On most sugar estates there are waste lands on which one or more of the new products might easily be grown; and if these lands were now clothed with cacao or coffee trees, how different would be the planters' outlook from what it is now!

The cultivation of Liberian coffee has much to recommend it; the tree is vigorous and productive, and, with careful planting a small crop may be reaped in three years. Liberian coffee (*Coffee liberica*) belongs to the natural order, *Rubiaceæ*, and it is indigenous to the West Coast of Africa, where it was discovered by AFZELIUS, A variety called Cape Coast coffee is sometimes described; but the differences between the two plants are so small as to render it undesirable to make any distinction in their names.

The tree, if allowed to grow unrestrained, would attain to a height of 20 or 30 feet, with a straight central stem and several slightly smaller but similar ones starting off at, or near to, the ground. Looked at from a distance the tree appears of a pyramidal shape, and the dense and large foliage, of a dark but rich glossy green, forms a most pleasing contrast to the snow-white flowers and the bright red fruit.

The branches of a fully grown tree will spread out to a distance of at least 5 feet from the stem; and thus

it will be seen that a single tree will cover with its branches an area of 100 square feet. The stem is rough, and of considerable thickness and toughness,—the wood being of a hard compact texture. The tap root is very long, and the fibres are extremely strong, so that a fully grown tree is most firmly rooted in the ground. As a proof of this I may state that after the hurricane of September 1883, I found some of my coffee trees broken across at the crown or junction of the root and stem; and, although all the others were bent and twisted about in various directions, in no single instance was a tree uprooted.

The leaves have sheathing stipules and they are opposite on the stem; their shape is ovate with a blunt pointed apex, and an entire margin. At the base the leaf tapers into a short, but stout petiole. Their size varies, the younger trees having the larger leaves; I measured some average leaves and found them to be from 8 to 12 inches in length, and about 4 inches across the widest part.

The branches are given off with great regularity from the axils of the leaves, they are at first erect; but, after a time as they lengthen, they become straight and then drooping. The internodes are from one to four inches in length, the longer ones being formed in the rainy season when all vegetation is most vigorous.

The flowers are jasmin-like, and their odour is delicious, having that characteristic flavour which seems to me to pervade the *Rubiaceæ* of the tropics. I do not know whether any one has made the remark elsewhere, but I have noticed that many allied plants have allied perfumes —the base of the perfume, so to speak, is the same for

the group, and the species have added to them an individual odour which modifies, but which does not altogether efface the original perfume. This is so in the case of the coffee. The perfumes of the flowers of *Coffea arabica* and *C. liberica* are almost identical, and they are much like the powerful and fragant odours given off from the flowers of Ixoras, Gardenias, and other rubiaceous plants.

It is unnecessary here to enter into any exact botanical description of the flower and the other parts of the plant, for the object in view is more of a practical than a scientific nature; I may, however, point out that the berry of the Liberian greatly differs from that of the 'creole' coffee. In the latter plant two coffee 'beans' invested by their double covering of 'silver-skin' and 'parchment' are enclosed in a reddish sweet-tasted soft pulp, in consistency not unlike that of the cherry of temperate climes. Hence, no doubt, one gets the common description of coffee 'in cherry' as applied to the whole fruit but I would here protest against the perpetuation of a term which I regret to find is still used by those who ought to know better. My business agents in writing to a West Indian 'botanist' used the term 'berry,' and their correspondent, to my amusement, informed them in all gravity that they should call the coffee fruit "a cherry." Now a cherry is a kind of fruit known to botanists as a drupe, it is not a generic term like nut, and it is applied with accuracy only to the fruit of *Cerasus Avium* and *C. vulgaris*, and their cultivated varieties. Berry is the correct botanical description of the fruit of the coffee tree; and, on the principle of calling things by their right names, I always speak, and like to hear, of coffee

berries. In the creole species the pulp, being soft, is easily separated from the seeds—which form the coffee of commerce; but the pulp of the Liberian fruit is of a hard fibrous nature, and hence the increased difficulty of pulping operations of which I shall have to treat later.

Ordinarily two seeds, or 'coffee beans,' are found in each berry, and this shows that both of the ovules which the flower contained were fertilised by the pollen: the well-known coffee 'bean' gives evidence of this arrangement in that one of its sides, the external, is rounded, while the other when it was in contact with its fellow, is flat and marked by a longitudinal furrow. But, sometimes, by abortion or by non-fertilisation of one of the ovules, only one of the seeds is developed, and as this has the whole of the fruit coverings for its accommodation, it becomes larger and rounder, being indeed, of an oval form. This is the 'pea-berry' of commerce, which is supposed to have a better flavour, and hence a greater value than the ordinary coffee. Machines are made for separating the pea-berry; and the term is found in the market reports with higher prices set against it. As a matter of fact, however, the so called 'pea-berry' is a mistake from beginning to end. It is not a pea, and it is not a berry; it has no finer flavour, and no higher value than the ordinary seed; but, inasmuch as it occurs in the Liberian coffee with much greater frequency than in the Arabian kind, the planters will doubtless be contented to allow the perpetuation of a popular fallacy which enhances the value of some of their produce.

The plant commences flowering in Dominica at the beginning of the year, and it continues in an intermittent

manner for several months. A more beautiful sight than a coffee plantation in full flower can scarcely be imagined. The trees look as though a snow storm had passed over them, the branches appear almost covered with white blossoms, and towards the afternoon the ground is strewn with the fallen corollas, which remain on the tree for only a day at the most. The perfume is delicious, it pervades everything and diffuses itself far and wide.

A valuable essence might be made by the pomade process from the fallen blossoms, and the idea is worthy of attention in coffee countries. Those who care to try the experiment will find the *modus operandi* fully detailed in Dr. PIESSE'S valuable work on the Art of Perfumery.

Even after the principal flowering is over, several smaller flowerings occur, and, as the fruit takes nearly a year to ripen, the curious sight of flowers and fruit in all stages of development is often seen. The fruit remains a long time on the tree before it withers, and this is an important advantage to the planter. In the case of the ordinary coffee the crops must be picked at maturity, or the berries fall and much coffee is lost; this is a most serious matter, too, when labour is not abundant; and in the olden times when coffee cultivation was one of the leading West Indian industries, all hands, including house servants and even the members of the planter's family, often took part in the annual harvest. In regard to the fall of the berry, the following remarks were made ten years ago by Mr. H. E. STAINBANK.—"It is probable that the scarcity of labour has had much to do with the stationary character of the coffee enterprise at the present time. As coffee is pre-eminently

a pursuit requiring constant vigilance and instant attention, a want of hands at a critical time causes such loss that planters fear to undertake the risk."* Another advantage possessed by the Liberian coffee is that it thrives on the low lands of the tropics; indeed, it may be cultivated with success within a short distance of the sea shore. Arabian coffee grows best at from 1000 to 4000 or even 5000 feet above the sea. I cannot say, from my own experience, what is the elevation at which Liberian coffee ceases to be productive. It thrives well in Dominica at 1500 feet, and I believe in Ceylon it is grown at double that height, but it appears to do best in the West Indies under 1000 feet.

A light loamy well-drained soil is most suited to the growth of the coffee; but it is a very hardy plant, and it will live in almost any soil except stiff clay and sand. It is said that the coffee soil of Liberia is alluvial on the coast and gravelly in the interior. I imagine, however, that the abundant rainfall, and the consequent humid atmosphere, in which the coffee tree delights, has much to do with the adaptability of the gravels for the growth of the plants.

In those parts of the West Indies where hurricanes occur, shelter belts of trees are a necessity; but they are required for shelter alone, and not for shade. It has been the custom in this part of the world to plant coffee in small squares formed by the intersecting tree belts. This system was begun only after the first coffee estates were devastated by hurricanes. The original motive, however, has been lost sight of, and the shade given by the tree belts is now considered to be the one thing most

* *Coffee in Natal: its Culture and Preparation.* London, 1874.

necessary for coffee cultivation. In parts not liable to destructive storms I would not advise the system of squares; for reasons, however, given in a former number of *Timehri*, I am no advocate of any large unbroken extent of one cultivation, and, therefore, I consider occasional belts of trees advantageous. But these belts need not necessarily be of unproductive trees, for the planter should strive to get a return from every part of his land. Oranges, limes, and other trees of economic value, may be employed; and, when forest land is cleared, the more valuable timber trees may be left.

The Liberian coffee tree delights in the sun, providing it gets a sufficient amount of moisture. Full grown trees have very long tap-roots, and thus, when the surface of the ground is parched, they can get the necessary moisture from the sub-soil; but, in the case of the younger cultivation, some shade is essential in the dry season, and the roots of the plants may with advantage be 'mulched,' that is, covered with dried weeds, cane trash, straw, and even wood shavings. For the purpose of shading the younger trees I usually plant plantains between the rows of coffee, but I have found the pigeon-pea (*Cajanus indicus*) to answer equally well. This plant has the deserved reputation of enriching the soil by throwing down large quantities of leaves, besides which, its roots penetrate to a considerable distance, and thus when the stem is cut down, as it should be as soon as the coffee is well grown, the soil is improved by the decaying roots, and by the free entry of the atmosphere into the channels formed in the ground by such decay. When the coffee trees commence to bear, the shade plants had better be taken away altogether, for otherwise the coffee

will become 'leggy,' and the crops will be smaller. I have entered so fully into the details of planting coffee in a small work I published in London, in 1881, that it seems unnecessary to go over the same ground in this article, for extended experience does not induce me to alter the directions I there gave for the successful planting of a coffee estate in the West Indies. As, however, this article would be incomplete without directions for planting, I will state, as concisely as possible, what precautions should be taken in raising and planting out the coffee trees.

A sheltered piece of land in a moist situation, or within easy reach of a good supply of water, having been chosen, it should be laid out in beds for the reception of the seed. If possible the nurseries should be made near the planter's house so as to be frequently overlooked, for they require constant attention, and it may be necessary to visit them at nights to kill any nocturnal insects that are fond of cutting the stems of the seedlings. Where it is not intended to plant the coffee on a very large scale, I would recommend that the seeds be put in boxes nearly filled with loose earth, and raised some distance above the ground; for in this way the young plants can be better attended to, and there is not so much danger of the ravages of caterpillars and other voracious insects.

The seed beds must not be too wide, they ought to be well manured, and the earth should be dug up and pulverised, every root and stone being carefully removed. If the soil be stiff, some sand or charcoal dust may be mixed with it, for the delicate rootlets of the young plants require a loose soil which they can penetrate

easily. The seeds are to be set in the ground with the flat side downwards and at a depth of about an inch and a half below the surface, and three or four inches from each other. A thin layer of finely broken charcoal may with advantage be placed over the seed beds, for this keeps down weeds and helps to retain moisture. In favourable weather the seeds will germinate in about six weeks, and the seedlings will be ready to transplant in about ten months. For the purpose of hardening off the plants I adopt the plan of transferring them, when they have three or four pairs of leaves, into bamboo pots, and when the plants are about a foot high they are put out into the fields.

Having finished planting the seed in the nurseries, attention may now be directed to the preparation of the land. Forest land is, of course, the best suited for the new plantation, inasmuch as the plants will grow better in virgin soil, and will not require any manure for a long time. If forest land be chosen, belts of the trees should be left at distances of about 500 or 600 feet; but, in places where destructive storms are likely to be experienced, the belts should be much closer. On my own estate the coffee is planted in squares formed by intersecting belts of lime trees, and these squares are 120 feet across. When cleared land is chosen the tree belts should be planted, if possible, before the coffee. The burning of the felled forest ought to be done as carefully as possible, the topped branches being strewed evenly over the ground before the fire is set. It is preferable to allow the large tree trunks to rot on the ground, for in this way the soil becomes enriched gradually.

The next thing is to line out the land, pickets being

put in the spots where the coffee is to be planted. Care should be taken to get the lines symmetrical, for a badly lined estate is an offence to the eye, and it bothers one in giving tasks to the labourers. The distance at which the coffee should be planted is still a moot-point. I believe, however, that ten feet either way is the best; although I may mention that in Ceylon this distance is thought to be far too wide. But, as a matter of fact, I have adopted ten feet distances on my own plantation, and the branches of the older trees have already grown into each other. I would advise, therefore, the longer intervals for good level land, and the shorter ones for hill-sides, and for land that is somewhat poor. Holes must now be dug where every picket stands, and these holes should be at least two feet square and two feet deep—*i.e.*, eight cubic feet of earth must be removed The holes are to be left open for several weeks or even longer, so as to oxygenate the soil; and, then, they should be filled up with weeds and surface earth from the vicinity, care being taken to keep out stones and large roots. After a week or two the weeds will decompose and form a rich soil which will sink down and leave a shallow hole, and this is to be again filled up with surface earth, with or without manure, according to circumstances. It is advisable to raise the earth somewhat, leaving a small mound where the hole was, and on the top of the mound the young coffee tree is to be planted. The object of this system is to allow for the subsidence of the earth, as it is found, no matter how well the holes are filled, that sinking almost always occurs; and thus, after a time, the young plant will be left in a depression, unless the soil be heaped up as described.

The trees should be planted if possible at the commencement of the rainy season, and on no account should the seedlings be put out in the fields during dry weather; for, until the plants are firmly rooted in their new situations, a few days' sun and dry weather will most certainly kill them. Temporary shade may, however, be afforded by fixing small branches of trees in the ground around the plants, or a few sticks pushed into the earth may be made to support plantain or fern leaves in such a way as to give light shade to the young coffee trees. If dry weather come on suddenly after planting, the coffee trees ought to be watered at least once a day until they become well-rooted in their new situations, for unless this be done a large proportion will die.

One cannot impress too deeply upon the planter the necessity of giving close attention to every detail connected with the raising and establishing of the coffee trees, and I do not, therefore, need any apology for quoting the following paragraph from my little work on Liberian coffee.—"Too much care cannot be bestowed on planting out the coffee in the fields, for at this time the results of all the previous work are liable to be swept away by inattention to what to the inexperienced may appear to be trifling details."* I am glad to find that my remarks on this head are in accord with the published convictions of so able a botanist and so distinguished an agriculturist as the Director of the Public Gardens and Plantations of Jamaica. Mr. D. MORRIS writes as follows:—"All the operations connected with planting are of so important a character that too much care and attention cannot possibly be given them. On the mode in

* *The Cultivation of Liberian Coffee in the West Indies.* London, 1881.

which the plants are put in and the plantation started depends the whole success of the undertaking and to realise these considerations in their fullest sense may very fitly be termed the *essential* elements in the character of a good and successful planter."* When the young plants are rooted they still require careful nursing until they throw out several pairs of primary branches. They should be kept free from weeds, shaded from the sun, and protected from strong winds. As I have already pointed out, shade and protection are given by the plantains and pigeon-peas which were recommended to be planted between the rows of coffee; but the roots require more protection than this in very hot and dry weather, so a system of mulching may then be employed.

It is scarcely necessary to remark that the plantation ought to be kept clear of weeds; indeed, after the coffee trees are put out in the fields, it will be found that the weeding is one of the principal items of expenditure. Coffee is intolerant of weeds, for the nutrition of the plant is carried on mainly by a vast number of superficial fibrous roots. If, therefore, the plantation be not kept clean, the weeds will feed on those soluble portions of the soil that should be left for the coffee, with the inevitable result of sickly trees and short crops. The truth of this was brought home to my mind some time ago by the following facts. A small patch of my Liberian coffee cultivation was neglected for awhile, and the weeds grew up thickly and quickly; soon afterwards the leaves of the coffee turned yellow, the trees appeared to be sickly, and but few berries were seen on the branches. The patch was then weeded and kept clean, but nothing else

* *Notes on Liberian Coffee, its History and Cultivation.* Jamaica, 1881.

was done. In a short time a wonderful change was manifest, the yellow leaves fell, and were succeeded by vigorous and healthy foliage, the plants grew quickly, and now they are loaded with berries.

Liberian coffee cultivation being altogether new, the treatment of the trees has been hitherto a matter of experiment, for the planter has had but little recorded experience to guide him in his undertaking. The questions of 'topping' and pruning are not yet definitely settled, but numerous experiments, and a careful consideration of the results obtained, lead me to advise the adoption of the following system. For convenience of description I will surmise that a Liberian coffee tree over six feet high has been allowed to grow unrestrained, and that my readers are about to watch the operation of pruning it. First, the tree is to be 'topped' at five feet and a half feet, that is to say all the portion of the stem above the height of $5\frac{1}{2}$ feet is to be cut away. A rod the exact length may be used for measurement. Several secondary stems, some in the nature of suckers will likely be found given off at or near to the ground, these must be removed at once, as must also any suckers found higher up. Next, each lateral or 'primary' branch should be taken in hand, and all *its* lateral or 'secondary' branches which are given off within a span's distance from the main stem are to be cut away, the object being to allow an open space all round the stem in order that light and air may be easily admitted. Should it be found that more than one secondary branch is given off from each side of the node or knot of the primary branch, the strongest and best formed is to be selected, and all the rest are to be removed. The tree may now be left for about a

month when it should be inspected, and all suckers that have developed in the meantime must be taken off. Usually they are so soft and green that their removal is easily effected by a rubbing motion of the forefinger and thumb, and this is known by the technical term of 'handling.' The various pruning operations may be summed up in the following few words:—The tree is not to be allowed to grow more than five feet and a half high, a clear circular space of about sixteen inches in diameter is to be preserved in the centre of the tree—this space being intersected by the naked bases of the primary branches only. And, in regard to the secondary lateral branches, no more than two are to be allowed to develop from any node of the primary, these two branches taking the place of the pair of leaves in the axils of which they were budded forth.

The clear space which is to surround the main stem is most useful in allowing a free circulation of air, and in permitting the sun to reach the roots, thereby equalising temperature, preventing stagnant moisture, and doing much to hinder the growth of mosses, and other parasitic or epiphytic plants, on the trunk and the principal branches.

None but the more intelligent labourers should be permitted to 'top,' prune or 'handle' the trees; their tools, too, should be kept in good order, for a blunt knife or saw will cause delay and give rise to bad work. One man can easily prune a hundred trees a day if they are not neglected, but if the trees have been allowed to grow unrestrained for a long time, then to prune forty or fifty is a fair day's work.

As I have already remarked, if forest land be cleared

for the coffee plantation, no manure will be necessary for several years; but the case is different if the land has already been cultivated. Then manure is indispensable, and, as far as I know, cattle dung gives the best results. It will be well, therefore, for the coffee planter to keep horses, cows, &c., and a compost heap can be made by mixing the cattle dung and stable litter with all kinds of refuse, such as coffee pulp and parchment, weeds, road sweepings, and such like. The holes for the reception of the manure had better be dug two feet long, one foot deep, about a foot wide, and at the distance of two feet from the stem of the plant. In digging the holes all large roots should be left, but the smaller fibrous ones can be cut with advantage. The manure should be spread at the bottom of the holes, and covèred over with weeds and surface earth, which must be well rammed to prevent washing during heavy rains. If the coffee be planted on hill sides, the holes ought to be dug above the trees, so that the soluble portions of the manure may be washed down to the roots; but, on level land, the position of the holes is of no importance.

The question of artificial manures is a difficult one to treat of, indeed each planter should decide the matter for himself, as it depends on conditions that may be different for each estate. No greater mistake can be made than to imagine that artificial manure which works wonders on one plantation should be equally serviceable on another. The soil ought first to be analysed, and then the planter will know what substances are required to render the tree fruitful; it may be, too, that all the necessary constituents exist in the soil in a crude form, but that they may require some manipulation to render them

capable of being taken up by the plant, that is to say the soil needs a mechanical, instead of a chemical treatment. It would be out of place here, however, to enter into the consideration of such matters, so I would recommend those of my readers who care to pursue the subject further, and who are unacquainted with scientific agriculture, to obtain one of the excellent manuals that are now published—the works of Professor TANNER being, perhaps, the most lucid in exposition.

Considerable difference of opinion exists in regard to the advisability of taking off 'catch-crops' from the coffee land, that is of cultivating some plant whilst the young coffee trees are growing. I think the system an advantageous one, providing that the coffee is not too much covered up. The land will then be giving some return, and the weary waiting for shipments of coffee will be broken in upon by the sale of the catch crops. Maize, plantains, sweet potatoes, tannias, and other food-products can be raised, according to the fancy of the planter and the local demand for vegetables. I have already recommended the planting of bananas or pigeon-peas to shade the young coffee, the bananas may be sold locally or shipped to the United States where there is a ready demand for them ; and if cattle be kept, as I have advised, the pigeon-peas will be most serviceable as grain, for they contain much flesh-forming material.

The advantage of keeping down the trees by topping is seen when the crops are gathered, for the highest branches can be easily reached by the pickers. Some of my own trees have been allowed to grow to a considerable height, and it is necessary to use step ladders in picking the berries. Besides this disadvantage, I find

that the high trees are fruitful only at the top, the lower branches remaining for the most part sterile.

The return from an acre of land varies much, of course, according to the nature of the soil, and the condition of the cultivation. Mr. D. MORRIS gives from three to four hundred weights as the average, whilst the Netherland Consul in Liberia, as well as some Ceylon planters, speak of thirteen hundred weights as a possible yield.

Liberian coffee commences to ripen in Dominica, about December, and goes on ripening for several months, thus entering upon the time of flowering. Great care, therefore, is required in picking, lest the flowers and flower buds be rubbed off. I find that a woman can easily pick three bushels a day; but, as the labourers are quite new to the work, it is expected that larger quantities may be picked when they become dextrous. The hard fibrous pericarp renders pulping operations far more difficult than in the case of the Arabian Coffee, and I have been put to a good deal of trouble and expense in my experiments in the way of machinery. I find GORDON'S 'breast-pulper' quite useless; the old 'rattle-trap' described by LABORIE answers fairly well but the machine is now very hard to get. My experiments were made on a venerable affair that had seen its best days fifty years ago, when Dominica was one of the principal coffee producing countries. As I was unable to get one of these machines, I ordered from Ceylon a disc-pulper specially made by Messrs. WALKER and Company of that island for the Liberian Coffee. It is an admirable piece of mechanism, and it pulps the berry well; but it does not separate pulp from seed, and a sieve is required to work with it. I am now

experimenting with sieves, but I have not yet obtained satisfactory results.

Fortunately, however, Mr. EDWARD S. MORRIS of Merrick Street, Philadelphia, U. S. A, —who has done so much to push on the prosperity of the Republic of Liberia,—has perfected a machine for treating the coffee in 'dry berry.' The berries, when picked, are simply dried in the sun, or on floors of buildings, and, when they are so dry as to make a rattling noise on being shaken together, they are bagged and shipped to America, where the coffee is hulled, cleaned and sized ready for the markets. It is maintained that the coffee so treated is increased in value, inasmuch as the seeds, being dried in their natural coverings, have a finer aroma than when they have undergone the fermentation and washings necessary in the ordinary process of preparation for shipment.

My small crops have, hitherto, been shipped in this way, and my last account sales, received from America about a month ago, showed that Dominica Liberian Coffee was worth £3 19 4 a hundred weight,—which is a very good price considering the present state of the coffee trade. Mr. MORRIS has recently discovered a market for the shells, and this further increases the value of the coffee in 'dry berry.' The shells have sold for two cents a pound; but the price is now one cent, and I am told that any quantity can be disposed of at that sum.

It is thus seen that this new system has many advantages, and to the planter who has not the capital to erect expensive machinery and washing cisterns, its adoption is necessary. Against it, however, is the fact that the 'shells' form so large a part of the dry-berries

that there is much increased expenditure in bags, carriage to place of shipment, and freight to port of sale. Only about 30 *per cent.* of clean coffee can be obtained from the dried berries, and so one has to deal with 70 *per cent.* of what is nearly a waste product.

I have recently had some interesting correspondence, about this matter, with Mr. W. A. BROWN, a manufacturer of coffee machinery in Lynn, Mass., U. S. A. Mr. BROWN has made some valuable calculations which I cannot do better than quote *in extenso.* He says ;— "Suppose a planter has in his bins 1000 pounds of unhulled coffee. He asks, How can I get the most for it. If he ships it here *unhulled*, the charges are, freight on 1000 pounds, and 1 cent per pound on 1000 pounds for hulling, cleaning, sizing, selling, &c., &c. Now we will assume for argument that the freight is worth $15 per ton of 2000 pounds or $\frac{3}{4}$ of a cent per pound ; then it stands thus :—

1000 lbs. unhulled coffee yield say 300 lbs. clear coffee at 14c...		$ 42 00
700 lbs. hulls yield say 600 lbs. free from dirt &c. at 2c.		12 00
		$ 54 00
Hulling, sizing, bagging and selling 1000 lbs. unhulled	$ 10 00	
Freight on 1000 lbs. in hull	7 50	17 50
Net result		$ 36 50

or 12c, per pound for the clean coffee

Now, suppose the planter cleans it himself, he then has, we will say :—

300 lbs. at 14c.		$ 42 00
Cost of cleaning not less than 3c. per lb. ...	$ 9 00	
Freight on 300 lbs. at $\frac{3}{4}$c.	2 25	11 25
Net result		$ 30 75

or a result of 10 c. per pound for his coffee and all the trouble and delay of cleaning it.

It would thus appear that the results by Mr. MORRIS'S system are better than if the coffee were pulped and hulled on the estate; but in the above calculations two cents a pound are set down as the value of the hulls. As a matter of fact, however, the present value is one cent a pound, and this reduces the net result by $6, showing a slight gain to the planter if he clean the coffee himself. It remains to be seen, too, whether the cost of preparing the coffee on an estate will prove so high as three cents a pound, and recent calculations have led me to believe that it will not be so. However, Mr. MORRIS deserves infinite credit for what he has already done, and he will doubtless be able so to improve on his process as to hold out substantial inducements for planters to adopt his system.

I may now make some remarks in regard to the probable return per acre, and I will base my calculations on the figures of Mr. BROWN who shows the value of the coffee to be 14 cents a pound, that is to say £3. 5. 4. a hundred weight—a sum much smaller than what I sold my last coffee for. If four hundred weights per acre be taken as the return, and this I believe to be a *minimum* calculation, the gross value of the coffee would be £13. 1. 4—say £13 in round numbers. The cost of cultivation and shipping expenses may be put down at £7 per acre, and this would leave £6 an acre as the net profit, if only four hundred weights be obtained; but every hundred weight over this means an addition of, say, £3, with very little increase of expenditure. Therefore a return of eight hundred weights to the acre would

mean something like £20 profit, and I believe such crops can be got by high cultivation, at all events they are obtained in Ceylon where the land, according to Sir JAMES LONGDEN, is not nearly so rich as it is in the West Indies.

One disadvantage in planting coffee is the length of time the tree takes before it comes into bearing, but to those who have sufficient capital, and who are able to wait for three or four years no better cultivation can be chosen. A coffee estate is a charming sight at all times; the various operations of cultivation and preparation of the crop are full of interest; and the undertaking is certain to be remunerative, more or less, according to the amount of care and intelligence brought to bear on the cultivation.

At the beginning of this century a large proportion of the coffee consumed in the world was grown in the West Indies, and now, in some of the colonies, coffee cultivation is a matter of past history. Its decline was due to different causes in the various colonies, but these causes do not now exist, or their effects are no longer insuperable, and the Liberian coffee planter, for whom this article has been mainly written, can now command the success that he deserves as the pioneer of a new industry. If he be able to derive any useful information from the foregoing record of many experiments and of several years' experience, there will be a partial realisation of the writer's earnest hope to help to establish new and remunerative industries in these fertile lands which should be the homes of a busy and prosperous people.

On Commercial Relations with the Dominion of Canada.

By P. H. Nind.

THERE is a tradition which was told to PLATO by the priests of Egypt, and has been handed down by him to us in the Timæus, that in remote ages there existed a vast island filled with an enterprising people and great cities, in the midst of the Atlantic Ocean, and it extended westward from the Pillars of Hercules, filling the bosom of the Atlantic from the islands that lie off the coast of Africa, to within a short distance of the shores of America, and through some terrible cataclysm of nature this large and important country disappeared beneath the waves.

However civilized and important this country may have been ten thousand years ago, is a problem that merely excites the curiosity of those amongst us who are addicted to archæological lore; it does not in the smallest degree appeal to the sentiments of every day life, nor to the instincts which animate us in the struggle for existence,—and so generally the subject is one that would be treated with indifference.

Supposing, however, some fine morning we should read in our telegraphic despatches that this continent-island, as large as Australia, or the United States of America, had re-appeared, and was found to contain intelligent and well-to-do inhabitants, agriculture on an extensive scale, arts and manufactures, and a mercantile marine, and above all, that its people were influenced

by the wants of civilization, such as the Anglo Saxon carries with him wherever he goes,—how suddenly would this hobby of the antiquarian become invested with a real living interest; what a beautiful form of flesh and blood would these old dry bones assume!

As members of an industrial community, of a country that lives by its exports, every one would be full of hope and of expectation of good things to come from this discovery, and the common topic of conversation and of newspaper articles, and the burthen of public meetings in this time of unexpected gloom would turn to Atlantis as the *Deus ex machinâ* which should deliver the country out of its straits.

Is this the prelude to an idle story, is it merely the stuff of which dreams are made, or has it in any way a local application?

I trust to be able to show you before I reach the end of this paper that a change of name will remove my imaginary sketch out of the realms of Utopia, and clothe Atlantis with a practical interest directly personal to the inhabitants of this colony.

For Atlantis then I substitute Canada, the great Northland, that every year is advancing in population, in wealth, and in power; not as a matter of fact an undiscovered island, but still from a commercial standpoint almost an unexplored region to British Guiana.

Why is it that the Dominion of Canada and the colony of British Guiana, two parts of the same empire, should have so few transactions together, as to be not much more than geographical ideas to one another?

One reason is that Canada is overshadowed by her southern neighbour coming between us and her, and ab-

sorbing all our surplus trade which has been diverted from Great Britain, and so Canada is dwarfed by the more mature development of the wonderful country alongside of her, and has come to be regarded as a more distant and inferior United States, holding out no inducements why we should seek to be more intimately acquainted, with her; but the mistake here lies in the sweeping and undiscriminating manner in which the comparison is made between the two countries. Of course there is no comparison between the consuming power of the United States, and the consuming power of the Dominion of Canada, and if we were under the protection of the former country we should not now be labouring under our present embarrassments, this however by the way. Because the United States has over ten times the population of Canada, and over ten times the wants to be supplied, it does not follow that Canada can offer no advantages, and it must not be lost sight of, that she is a stranger to us, but no foreigner, and it might be easier to enter into reciprocal relations with her than with the North American Republic.

If any one will take the trouble to dissociate the Dominion of Canada in his mind from the United States, and will contemplate it as an isolated and independent country, under the light of statistical returns and current information, he will find it gains immensely; he will observe that it is a country travelling on the highway of true progress, that it is inspired by a patriotic energy, and is wisely opening out great national channels of enterprise, whilst promoting the religious and social well-being of its people in a very marked degree; he will notice that it has a soil and climate no way in-

ferior to the United States for the sustenance of life, and the growth of all those valuable northern products which are mostly in demand the world over.

It may be remembered by some that an effort was made about twenty years ago to draw together British Guiana and Canada in some kind of commercial connection; this was initiated by one who has made a name for himself in Canada as a statesman, and who had the interests of the two countries at heart,—Sir FRANCIS HINCKS. The attempt proved premature, and the causes of failure probably lay in the Canada of that day being comparatively speaking an insignificant country, made up of the two Provinces of Upper and Lower Canada, with a population under two millions; and besides, I take it, the necessity for obtaining a new market for produce was not then keenly felt in British Guiana.

But times are changed and we may change with them. Since those days the two Canadian Provinces have confederated with all the North American Provinces, excepting Newfoundland, and have added to their area the enormous territory of the Hudson's Bay Company, which includes Manitoba and the Great North West.

Stepping into the rank of nations as the Dominion of Canada, this group of united colonies extends from the Atlantic to the Pacific, a distance of nearly 4,000 miles, from Quebec to Victoria, Vancouver Island, right across the Continent of North America in its broadest part. This vast domain consists of 3,500,000 square miles, and is exceeded in extent only by the Empire of Russia, and perhaps by China. At present the Provinces are eight in number, 1. Ontario; 2. Quebec; 3. New Brunswick; 4. Nova Scotia; 5. Prince Edward's Island; 6,

Manitoba; 7. British Columbia; and, the North West Territory. In 1880 the population was 4,352,080 and now from natural increase and the incessant flow of immigration it must be about 5,000,000.

Within the last few months it has come home forcibly to one immediately concerned with the growth and sale of the staple of the colony that the markets we have depended upon are slipping from our grasp, and whilst we discuss all the turns of the sugar question, as far as our knowledge goes, and adopt such measures as lie within our reach to better our position in these two greatest markets of the world, we can really do very little of ourselves to help ourselves, seeing that on the one side we are barred by the prerogative of the Crown, on the other we come athwart the omnipotent band of doctrinaires who have put their hook in the nose of Leviathan, and lead him whithersoever they have a mind; and so, as a diversion if you will, as a means to an end, if I may indulge such a hope, you will allow me to-day to set a current of thought running in another direction.

The overproduction of sugar this year by the beet growing countries of Europe has caused an alarming fall of prices, one market has sympathized with another, until an equalization of values has taken place all over the globe, and we cannot expect any where to obtain the prices of past years; but fiscal preference in some country's tariff would be of paramount consequence to us, if only it relieved us of a portion of our surplus produce with certainty.

Suppose we turn globe trotters and mentally visit the four quarters of the earth to see if some country does

not invite a peaceful invasion of sugar hogsheads and rum puncheons.

First, on account of its populations, its wealth, and its wants, comes the continent of Europe. Protection under a highly artificial system shuts the door against us here.

Next we come to Asia, where semi-barbarous kingdoms, and nomadic hordes, and Russian exclusiveness hold out no inducements of trade. Only India is worthy of notice and her wants are chiefly supplied by Mauritius. It is plain we must look to settlements and colonies inhabited by the Anglo-Saxon race for any adequate demand of that commodity which in Great Britain and in North America constitutes one of the necessaries of life.

Having traversed the east we reach Australia and New Zealand, where the consumption of sugar and meat is greater per caput of the population than in any other countries under the sun. In these colonies the ground is occupied by Mauritius and by home-grown sugars. The same may be said of the Cape and Natal, they make their own sugar, and are supplied by Mauritius. The opening up of the Congo does not at present affect our commercial interests, nor does any other part of the "Dark Continent" attract our sugar-laden ships to its shores.

In South and Central America the different countries grow what sugar they require, or import it from their neighbours, or from Europe.

Only North America is left, which is, as Lord DERBY described it in replying to Lord CARNARVON from his seat in the House of Lords, "the natural market for West Indian produce."

Of the United States I would merely in this place observe that if we had possession of that market under Most Favoured Nation treatment, with no differential duties against us, we should not look further afield, but at the present moment we are not within measurable distance of that desirable consummation, and there are some considerations which make me think this precarious American market may be closed to us. This is a matter I will allude to further on.

The Dominion of Canada then is the only country which our excursion round the world has discovered, and I will now present some of the reasons which commend Canada to our notice as a nation whose custom is not to be lightly thought of at the present juncture, and I shall endeavour to show that her purchasing power is yearly increasing and likely to go on increasing by leaps and bounds.

The Dominion of Canada comes next to the United States in capacity for absorbing immigrants, and it will take many a decade to plant a tithe of her waste lands with Settlements, not because immigration to them is sparse or spasmodic, but from their limitless extent.

Lieutenant Colonel GRANT of Quebec in an interesting paper read before the Colonial Institute in February 1882 describes the North-west territory as having a total wheat area of 380,000 square miles, and estimated it to be capable of sustaining a population of a hundred millions. Yet this vast region is only a fragment of the whole, and does not include Manitoba, nor the stock raising district of the South Saskatchewan, nor the district of Keewatin.

Another writer on the same topic says, "It is in that

vast North-western territory to which so much attention is now being directed that we may expect to see for decades to come those illustrations of progress of which Illinois and other Western States are remarkable examples. The extent and value of that immense region watered by the Red, Saskatchewan, Athabasca and Peace Rivers cannot yet be accurately stated ; but the explorations of the Government and the pioneers who have already ventured into its solitudes, demonstrate that there is a sufficient area of rich lands out of which probably *ten* States as large and productive as Illinois may be eventually made."

This territory and Manitoba will give the Dominion of Canada the supremacy as a grain growing country over the famous wheat States of the West.

American authorities admit that the land of the Red River Valley as well as of the Saskatchewan and Peace River country is more prolific than that of any Western State, and a writer in HARPER'S Monthly for September, 1881, does not hesitate to express the opinion, that this country produces the cereals in a state of perfection which has not manifested itself further South. The superior quality of the wheat raised in this new country may be better understood by reference to the relative market values of northern and southern grains at Buffalo, where, what is called "No. 1 Hard Duluth," grown in the Dominion, was quoted about 4c. a bushel higher than "No. 1 Spring" (grown in the Western States,) and from 8c. to 14c. higher than the inferior grades of wheat grown in a more southern region ; whilst the flour from the same superior northern wheat brought $2 more a barrel.

The secret of its superiority lies in the fact that the wheat of the northern latitude makes a flour of greater strength.

The northern wheat is flinty and contains more gluten; the southern is soft and contains more starch.

The average yield of wheat, per acre, in the Red River valley north of Fargo is 23 bushels. In Manitoba and the Saskatchewan region the average is greater and amounts to 28 bushels. These figures become more striking when compared with results in the districts of the present American wheat supply. In Illinois the average for wheat to the acre is 17 bushels; the official returns of Minnesota, which is considered the best wheat growing State in America, place the average at 17 bushels; in Iowa it is 10; in Wisconsin less than 10; in Kansas 10; whilst in Texas it is 8½.

A similar superiority of yield of barley and oats also exists in the Dominion.

The American authority I have quoted above goes on to predict the possibility of there being ready for shipment within ten years, that is by 1891, on Lake Superior, an amount of wheat from Canadian territory which shall equal the total quantity now received yearly by all the Atlantic ports, at a price of 70 cents a bushel, which, after deducting the cost of growing and of transportation, will give a handsome profit to the grower. As wheat cannot now be raised in the Mississippi valley at this rate, other crops will have to be cultivated there, and the centre of activity in wheat will soon pass to the Red River valley, to go later, possibly, still further northward.

This remarkable article which I would recommend all to read who feel interested in the extension of British

power in North America goes far to corroborate what Lord BEACONSFIELD said at an agricultural meeting in England, that supremacy as a grain growing country would soon be attained by Canada, and that with this expectation thousands of persons from the States were hastening to change their homes to the other side of the boundary line.

It may be objected that I am placing Canada before you too much in the light of a land of promise;—as a corrective I will give you some facts and figures of solid progress. In 1881 the export of agricultural produce alone reached to about $60,000,000. The same year goods were imported to the value of $105,330,724; whilst the exports for the same period showed a balance of trade in favour of the Dominion to the extent of nearly $8,000,000. Nor must it be forgotten that Canada herself is now a manufacturing country, and her people are buying largely every year as well as exporting fine pianos, organs, carriages, boots and shoes, paper, tweeds, sugars, besides other articles manufactured cheaply and well in their own country. The ability of the people to buy such articles can be estimated from the fact that they annually deposit in chartered Government and other banks, and savings banks and building societies $100,000,000 and that the annual exports of the whole country are keeping pace with imports, thanks to superabundant harvests and a steady foreign demand for the products of the land and sea.

The cattle trade of the Dominion is thus alluded to in the *Colonies and India* for 6th June, 1884, "The Canadian Minister of Agriculture in his annual report refers as follows to the remarkable growth of the cattle trade

during recent years. The export trade of cattle from Canada during 1883 shows a large increase over the previous year, being 55,625 head of cattle against 35,378 in 1882, and the increase in the number of sheep exported is very striking, viz. 114,352 against 75,905 in the preceding year. The cattle trade of Canada has grown to be one of the greatest lines of trade of the country, and hundreds of thousands of dollars have been invested in it by shrewd and practical men. It is an established fact too that Canada is destined to become one of the most important cattle raising countries of the world, possessing as it does every facility for the conduct of an enormous trade. The grazing lands are ample and rich, fodder is comparatively cheap, labour is reasonable and the means of transport are unsurpassed. Within the last two years the value of the exports of live stock has been not less than $3,500,000 annually, while the total value of the cattle shipped from Canada, six years ago, was little more than $36,000."

The fisheries of the Dominion including those of the Pacific Coast and of the lakes in the interior are confessedly the most valuable in the world, and have mainly aided in developing that important marine which now places Canada in so high a position amongst maritime powers. Her maritime interest alone, that is to say, her fisheries and ships, had an estimated value of fifty millions of dollars in 1881.

The forests continue to supply superior pine timber to Great Britain and to the United States, the annual export being worth about twenty millions of dollars. Canada has also large mineral resources; on the Atlantic and Pacific are very extensive coal areas sufficient to

supply for centuries untold millions of people on this continent. The coal of Nova Scotia and of Vancouver Island is bituminous and excellent for domestic and manufacturing purposes, the annual output being valued at $3,000,000 apart from the large output used by the people themselves. Besides coal there are extracted from the earth in paying quantities, gold, iron, copper, phosphates and building stone, which are being gradually developed in the face of many obstacles, chiefly the want of sufficient capital; and it may interest those of my brother planters who believe in some form of lime being indispensable as a fertiliser in our heavy clay soils, to hear that Dr. STERRY HUNT, in a recent paper before the American Institute of Mining Engineers, called attention to the extent and importance of the apatite deposits of Canada existing in Ontario and Quebec. These areas have as yet been but partially explored. In 1883, 17,840 tons of apatite were shipped from Montreal principally to British ports. This year the shipments are estimated at 24,000 tons. I allude to this particularly because I believe it likely that some of the rock gypsum which several planters have used with excellent results on their fields during the last two years is this very apatite, and which besides lime contains phosphoric, fluoric, and muriatic acids.

No account of the progress of the Dominion of Canada would be complete without reference to its magnificent canal system, by which the obstructions to navigating the internal waters of the Dominion have been overcome, and the chief centres of commerce connected with one another. Navigation between Chicago and Montreal, through the great lakes and the St. Lawrence canal, is

much shorter than that between Chicago and New York via the Erie Canal. The St. Lawrence canals are wider too and admit vessels of double the tonnage.

Nature has endowed the Dominion with a noble artery of communication from the great lakes to the sea in the St. Lawrence, in the length of its navigation, the volume of its waters, and the fertility of the vast area of country of which it forms the highway of communication with the Atlantic. Following it, not from its remote sources, but from Fond du Lac at the head of Lake Superior to the Straits of Belle Isle, the entire distance is nearly 3,000 miles, almost as far as from New York to Liverpool, and yet Fond du Lac is 500 miles east of Red River, which is the eastern boundary of Manitoba, that central Province, which Lord DUFFERIN when Governor General of Canada happily termed the "bull's eye" of the Dominion. "The resources of the territory," I quote a recent authority, "to which the St. Lawrence and the Great Lakes are tributary, and form the natural communication with the ocean, are most varied, and have been developed of late years to an extent without a parallel in the history of commercial enterprise. When completed the Canadian canal system will be the finest in the world and will rival in importance the systems of the Suez and Panama canals."

Next to the United States, Canada has the largest railway area in proportion to its population,—one mile for every 690 inhabitants; and of the 59 States and Kingdoms of the world which have railway systems, Canada already ranks as the eighth in absolute mileage, and the fifth in the number of miles to each inhabitant. In 1881 there were 8,000 miles of railroad throughout

the Dominion and the net profits amounted to $7,000,000.

Canada is engaged to-day in a work of stupendous dimensions, the connection of the Canadian Pacific Railway in order to unite the whole system of railroads between the Atlantic and Pacific. The total length of line from Montreal to Fort Moody in British Columbia will be 2,900 miles—and it is said the whole line will be in running order in 1886.

The acquisition of the Great North West, the entry of British Columbia into the Federation, and the duty of opening up and settling a vast territory has necessitated this gigantic undertaking, and its completion across the continent will be of incalculable benefit to the Dominion of Canada. Being the shortest route to the East it will bring the commerce of China and Japan, Australia and New Zealand, nearer to London, and will give England a direct means of communication over British territory with her empire in the East. To use the words of the Hon'ble W. H. SEWARD, one of America's most distinguished statesmen, upon the value of the Canadian Pacific Railway, "having its Atlantic seaboard at Halifax and its Pacific near Vancouver Island, it would undoubtedly draw to it the commerce of Europe, Asia, and the United States. Thus British America from a mere colonial dependency, would assume a controlling rank in the world. To her, other nations would be tributary, and in vain would the United States attempt to be her rival, for she never could dispute with her the possession of the Asiatic commerce nor the power which that commerce confers." I observe it is stated in the *Colonies and India* of the 6th June, that "Passenger traffic is expected to commence towards the end of June

this year, and a thorough connection over the Canadian Pacific system will then be made between the sea ports of Eastern Canada and the Rocky Mountains.

It may not be out of place here to refer to an interesting statement presented to the Canadian Parliament which gives an insight into the working of the Federal System in the Dominion. The total amount expended by the Federal Government for public works since 1867, the year of confederation, was \$143,400,000, of which \$93,600,000 was on capital account, and \$49,800,000 from income. Of this sum no less than 90½ million dollars was expended on railways, 31 million dollars on canals, and 15½ million dollars on public buildings, harbours and breakwaters.

I have endeavoured to sketch the Dominion of Canada as it exists in the 'living present,' and I have touched upon her public works, her resources, and her purchasing power, with the future of greatness that undoubtedly awaits her. This part of my paper is a patch-work gathered from all the sources of information I could lay my hand on, with some statistics from this magazine, paragraphs from that article, and scraps of the latest intelligence from the *Colonies and India*. I plead guilty to plagiarism, but I also claim that plagiarism was unavoidable, for in the absence of statistical works of reference I have been obliged when annexing facts and figures sometimes also to adhere to the setting in which they were framed. I do not believe the deductions are in any way exaggerated, I rather would assume it to be the reverse, for most of the figures I have quoted are drawn from the Returns of 1881-2, and since then Canada has not stood still but has added largely

to her population, her trade, and her purchasing power.

I would pause here for a moment before carrying the argument to an issue, and looking back on the ground we had gone over I would ask whether this is not a country worth bestowing some thought upon, whether it would not be wise on our part to connect this country in our minds with our own colony, as possibly holding out a brighter prospect than is just now before our eyes. Such a thought may be kept well in hand pending the settlement of the question whether the United States will grant to British Guiana, Most Favoured Nation treatment or not; but such a thought may be entertained and discussed, and be ready to leap forth and take effect should the occasion present itself. It is an alternative policy, and I am happy to remember that the Planters' Association has taken this view, and has placed itself in communication with Chambers of Commerce in the Dominion of Canada for the purpose of eliciting information relative to those wants which British Guiana can supply, and of showing a good disposition towards Canada.

The Dominion of Canada has a population of about 5,000,000, and if the consumption of sugar were equal to the consumption in Great Britain and in the United States, which is estimated at 40 lbs. a head annually, then Canada must purchase 100,000 tons (American) a year for her wants; but it is possible this is too high a figure and perhaps it is safer, as a good deal of maple sugar is used in the hardwood districts of Canada, to reduce the quantity, 25 o/o, to 75,000 tons. Last year, the year of our largest exports to America, we sold less than 60,000 tons to the United States, and having so

good a customer greatly helped us with our account sales. If we could carry on a similar trade with Canada or a much smaller one at first it would still be of importance to us, and might expand hereafter into dimensions of sufficient magnitude to satisfy all our requirements.

I do not think, if we came to terms with one another that the Dominion would ever get all our sugars, for that would be to forego the advantage that the higher classes of Demerara crystals have won in the London market.

The basis of reciprocal relations with the Dominion of Canada lies in an interchange of trade whereby our products would be exchanged for the Dominion's products through mutual tariff concessions.

As I have hinted before it is my object now merely to break ground and to make this paper tentative and suggestive, I have therefore no intention to enter into the particulars of any new fiscal scheme, but I will enumerate some of our imports drawn from different countries all of which Canada exports.

List of some dutiable goods imported into British Guiana in 1883, with values and duties attached.

ARTICLES.	VALUES.			DUTIES.		
Bacon ...	...£ 737	15	2½	... £ 58	3	0
Beef ...	... 18,852	9	5½	... 3,331	6	10
Bread ...	... 22,249	7	11½	... 1,967	14	3½
Bricks ...	... 15,690	2	3	... 307	8	6½
Butter ...	... 30,188	8	8	... 2,967	14	3½
Candles, tallow	... 775	0	2	... 67	18	6
Candles, sperm &c.	... 888	6	11½	... 340	7	1
Cheese ...	... 8,146	3	0	... 1,179	2	8
Coals ...	... 73,304	16	0	... 8,511	17	1
Corn and Pulse	... 33,699	7	3	... 1,602	2	8
Corn Brooms	... 1,011	17	6	... 110	11	2½
Forward ...	...£205,543	14	5	£ 20,444	6	2

ARTICLES.	VALUES.				DUTIES.		
Brought forward	...£205,543	14	5	... £	20,444	6	2
Corn & Oatmeal	6,931	7	2	...	891	12	8
Fish, dried ...	100,764	3	11	...	7,353	13	11½
" Salmon	1,553	15	11½	...	174	5	5
" Mackerel	5,310	3	1½	...	559	14	1
" Herrings	5,334	6	5	...	294	6	1
" Smoked	308	19	4	...	33	9	3
Flour ...	124,894	10	5½	...	28,458	17	1
Hams ...	10,425	14	11	...	1,451	7	0
Hay ...	998	13	8	...	203	19	6½
Hoops, Wood	9,358	18	9½	...	1,810	9	2½
Horses ...	4,092	8	11½	...	167	14	2
Lard ...	16,164	6	9½	...	1,810	9	2
Lumber ...	52,730	3	3½	...	6,044	3	9
Oats ...	20,980	14	0	...	1,510	0	5
Pitch ...	657	10	5½	...	154	7	6
Pork ...	70,665	5	5	...	11,700	8	3
Shingles ...	7	1	8	...	1	13	4
Shooks ...	12,484	2	1½	...	1,265	1	9
Staves, W.O...	19,066	19	9½	...	658	14	11
" R.O....	7,606	4	2	...	298	6	10½
Tar... ...	866	12	8	...	136	2	11
	£676,735	17	5		£85,423	3	6

I find we imported in 1883 goods to the value of £173,372 19s. from British North America and exported to the same place produce valued at £93,898 4s. 7½d. to pay for the same, leaving a balance of trade against us of £79,474 14s. 4½d.

It may be fairly objected that several steps may be taken before reciprocal arrangements with Canada can come within the range of practical politics, and I would be the last to minimize the difficulties in the road. In the first place, I should not wish to jeopardize, in any way, international negotiations now pending, and in the next I do not know, nor does any one on this side the water know, the mind of Canada, supposing we were free to co-operate with her. On this latter point, how-

ever, it has been more than rumoured, that Canada is anxious to make a treaty of reciprocity with some sugar-growing country, both Cuba and Brazil being named, and it was mentioned last April in the *Colonies and India*, that the Finance Minister of the Dominion, speaking recently in the Canadian Parliament on the budget, stated, that the Government had taken into consideration the representations of the West India merchants of Halifax (Nova Scotia) for a modification of the tariff as regards the importation of raw sugar into the Dominion. The Government propose to reduce the duty on sugar imported from the country of growth to 27½ o/o, making the invoice for the payment of the duty free on board, including packages and all charges.

This movement shows that Canada has a desire to provide cheaper sugar for her people, and we have heard lately of new refineries being opened, as if the demand were increasing.

I should not be surprised if some Financial Representative were here to interpolate, "If we were to remit duties in favour of Canada how is the deficiency to be made up?" This is obviously a proper objection, and will have to be fought out whichever way you turn, whether to America or to Canada. Nature abhors a vacuum, used to be said, and so does a Secretary of State for the Colonies abhor a vacuum in the revenues of a West Indian Colony, for the right administration of which he is responsible.

There may be sources of revenue at present untapped, and so it is premature to prejudge the question, but I think we should all realize now, that when the time comes, if it does come, an attempt will most probably be

made to supply the deficiency out of the sugar hogshead, and this, as long as any other means remains untried, we should all be prepared to resist.

In the early part of this paper I referred to the United States as possibly not willing to grant us Most Favoured Nation treatment. I will now adduce some of the considerations which make for that view.

As it was through the act of Great Britain, British Guiana was not permitted to partake in the Most Favoured Nation article in the treaty of 1815 between Great Britain and the United States, so the United States Government may now very naturally object to grant British Guiana that privilege solely because it is our wish. The United States have fulfilled their treaty obligations fairly and honourably we may assume toward the other party to the treaty, why then should they step out of their way to be generous, because that other party has changed her colonial policy? England being a free trader has nothing to offer to America for this concession, and America might very well urge that the welfare of the British West Indies was nothing to her, especially if it did not run on all fours with her own foreign policy. America is not likely to accord exceptional privileges to any country without a counterpoise. Take the case of the Hawaiian Islands. Formerly they were British in their sympathies, and were more like a British colony than an independent kingdom, but the San Francisco people discovered these islands could grow sugar, and that their geographical position was unrivalled, so they began to develope them American fashion, entered into a Reciprocity treaty with them in 1876, to take all their sugars duty free, and to pay for them with American

goods duty free into Honolulu,—the first step towards annexation, if the present state of things is not more profitable.

Mexico is a similar case. American enterprise is now building railroads over that country, whereby centres of population are reached, and under the fiscal preference given by a treaty of reciprocity, American goods can be introduced and monopolise the best part of the foreign trade. Mexican sugars find a lucrative sale in the United States, and a great stimulus will be imparted to open sugar plantations throughout the *tierra caliente* or coast lands of Mexico, where every condition is favourable, climate, soil, labour, transport and capital attracted by the sure returns of a treaty-guaranteed market.

The United States has similar advantages to gain by entering into a treaty of reciprocity with Spain, and it may be that there lies in the background the old desire of acquiring Cuba, revived. A generation ago America offered Spain a hundred million dollars for the purchase of Cuba, in her eyes the very gem of the Antilles, and she has always hankered after a foothold in the West Indies. Much more recently the acquisition of St. Thomas and of Hayti has been recommended in high quarters at Washington.

The Americans, collectively, as a nation, are as shrewd as they are individually, and why should they give to this colony or to the British West Indies a preference when they can do better elsewhere. Evidently Her Majesty's Government are not very sanguine on this point, for when the West India Committee last February first urged the extension of the Most Favoured Nation

clause to the West Indies, Lord DERBY is reported to have said that "Her Majesty's Government would be very glad if it were possible to obtain such extension, but that there was no prospect for negotiations leading to such results;" and subsequently on 4th April when replying to the deputation that waited on him, the Secretary of State for the Colonies said that he had communicated with the American Ambassador on the subject, and his opinion was that "it was not a question which could be raised at the present time with any prospect of success."

It is not an extravagant thought to entertain that American statesmen foresee that a refusal on their part to make a fiscal exception in favour of the West Indies will create a great commercial crisis in the West Indies, which will cause the policy of the mother country to be called in question as harsh and unsympathetic, and will lead to a strong feeling against England; and that then it will come to be considered whether, since the present state of things is bringing heavy losses to all, and ruin to a staple industry at no very distant date—it will come I say to be considered and discussed in the street, and in the chamber, whether a political union with America will not be a thing to strive for as holding forth realisable hopes of future prosperity and opening the door to a higher and more independent position.

If an American statesman has such thoughts is he to be blamed for stretching somewhat the elastic principle of the Monro doctrine? As a British subject and sincerely attached to the institutions of the Empire, I earnestly hope that day may never come, but I cannot shut my eyes to the drift which is setting in, and I would do

whatever laid in my power to stop it from going too far; therefore I have written this paper in the hope that if negotiations between England and America do not eventuate as we all desire, and so many anticipate, we may as an alternative policy turn to a country under the same flag as ourselves, and which, if we managed to secure her markets, would not be ever likely to plough up her wheat fields and substitute beet as a rival industry to our own.

Soluble versus Insoluble Cane Manures.

By E. E. H. Francis.

Introductory Remarks.

ACCORDING to the Official Blue Book an amount of sugar equal to 129,592 hogsheads was exported from British Guiana in the year 1883, although the actual quantity manufactured is not stated. It appears, however, that 79,037 acres of land were under cane cultivation, which, at an average of two hogsheads per acre, would yield 158,074 hogsheads. The exact amount of sugar probably falls between these numbers, but for the purpose of this paper the latter may be taken as the current production.

The value of the artificial manures imported during the year (15,082$\frac{5}{20}$ tons) was £156,159, which, with 25 per cent. added for freight, commission &c., represents a sum of £195,198, or 24/8 per hogshead of sugar produced, paid by planters for artificial manure exclusive of lime. Presuming that twelve tons of cane yield a hogshead of sugar, it could be easily proved that 24/8 would be sufficient to purchase in the form of artificial manure nearly all the mineral ingredients required by that amount of cane; so that if the manures imported properly fulfilled their purpose, the soil need contribute scarcely anything towards the maintenance of the plant. It is, however, far from certain that the large amount of money now being devoted to the purchase of manure is expended to the greatest advantage, and there is every reason to believe that a consider-

able proportion of the manures employed is wasted, partly by being converted into insoluble inert compounds in the soil, and partly by being washed out into the sea by drainage.

The principal inorganic or mineral elements essential to the growth of the sugar cane required to be furnished in sufficient quantities by the soil naturally, or by manures mixed with the soil, are potassium, nitrogen, sulphur, phosphorus and calcium—these elements being ranged in the order of their relative importance. Most compound manures contain all these elements in greater or less quantity, but the money value of a manure depends almost wholly on the amount of potassium, nitrogen and phosphorus it contains; compounds of sulphur and calcium being so abundant and readily procurable, and their value so small in comparison with the other elements specified, that they are almost altogether neglected in the pecuniary valuation. Furthermore, compounds of potassium, for some not very definite or satisfactory reason, are unwelcome ingredients in cane manures, and are seldom met with in them to a greater extent than one or two per cent. Thus we arrive at the remarkable fact that the sum of £195,000 or thereabouts, annually spent by this colony on artificial manures, is almost entirely devoted to purchasing supplies of nitrogen and phosphorus! It is true these elements are very costly. Nitrogen is paid for at the rate of £100 per ton, whilst phosphorus costs about £110 per ton in the form of soluble phosphate, and about £62 per ton as insoluble animal phosphate; insoluble mineral phosphate is, however, very much cheaper.

There exists a great variety of substances suitable for

manures serving to supply nitrogen and phosphorus. Thus in the case of nitrogen, there are simple salts, such as sulphate and chloride of ammonium, and nitrate of potassium, sodium and ammonium; and various nitrogenous animal matters as guano and other *excreta*, including stable and pen manure; also prepared bones, blood, flesh, fish and offal, waste wool, hair, leather and horn, glue refuse &c.; and numerous nitrogenous vegetable matters, chiefly the residual "cakes" left after expressing the oil from certain seeds, such as linseed, rape seed, cotton seed, poppy seed, sunflower seed sesame seed, coco and other palm nuts, earth nuts, &c. For supplying phosphorus, calcium phosphate (or phosphate of lime) is almost exclusively used, but various forms of it can be obtained, *e.g.*, ground bones, bone ash, steamed bone flour, spent animal charcoal or bone black, phosphatic or rock guano, coprolites (or the fossil *excreta* and bones of extinct animals), mineral phosphate such as apatite and phosphorite, also various kinds of chemically prepared or precipitated phosphate, and lastly and principally, "soluble" phosphate or superphosphate of lime, made by treating bone-ash, mineral phosphate or phosphatic guano with sulphuric acid. The last substance is soluble in water whilst all the other phosphates enumerated are insoluble.

Judging by the samples sent to the Government Laboratory for analysis, the manures that it is customary to use in British Guiana, are sulphate of ammonia to supply nitrogen, and superphosphate of lime to supply phosphorus, or mixtures made up of those substances in certain proportions. Guano is also extensively employed, but principally the so called "dissolved" guano, which

has been subjected to the action of sulphuric acid and thus practically resolved into a mixture of sulphate of ammonia and superphosphate of lime. It is difficult to ascertain how this preference for highly soluble manurial substances has arisen—whether from the results of properly conducted experiments, or merely due to following a fashion set by European countries. Certainly the almost complete absence from scientific literature of any experimental records bearing on the matter leads to the inference that the system of manuring at present practised is mainly empirical.* Therefore the point it is desired to draw attention to, and to help planters to practically determine, is whether the highly soluble and expensive manures hitherto employed cannot be replaced by others, equally efficient, but more economical and more suitable for use in a country like this, where the rainfall is so great, the system of drainage so perfect, and the soil so acid and ferruginous.

* In the last number of *Timehri* is a paper by Mr. Gilzean giving the results of field experiments with most of the principal cane manures used in the colony. No less than fourteen of these were subjected to comparative trial, but only in one or perhaps two instances were the manures other than sulphate of ammonia or superphosphate of lime, mixed or separate, or dissolved guano, which, as already stated, consists practically of the same substances. The results obtained by Mr. Gilzean are of course of great value as showing what the usual manures are capable of doing, but much fewer experiments would have sufficed for this purpose. It is indeed manifest that Mr. Gilzean has been at immense pains to carry out a remarkable series of supererogative experiments simply to ascertain the practical effect of the same mixtures sold under different names; the comparative value of which, or, in other words their richness in nitrogen and phosphorus, could have been arrived at with greater accuracy, and infinitely greater ease, by a few hours' examination in a laboratory.

On the disadvantages of ammoniacal salts and super phosphate as manures. The principal objection to be urged against the use of ammonia and its compounds as a source of nitrogen is the great loss that must result from drainage. As this loss comes about in an indirect way that has only been elucidated of late years some explanation concerning it may not be superfluous. In 1845 H. S. THOMSON observed that when water containing sulphate or carbonate of ammonium in solution is filtered through a layer of soil, the portion that has passed through contains scarcely any of the ammoniacal compound, the remainder having been absorbed or fixed by the soil. Professor WAY subsequently found that the salts, sulphate, nitrate and chloride of ammonium in solution in water, were all *decomposed* by the soil, and gave up their ammonia to it completely, whilst the acid (whether sulphuric, nitric or hydrochloric) which was in combination with the ammonia, united with other bases (usually the lime and magnesia present in the soil), forming soluble salts that filtered through. Phosphoric acid was not affected in the same manner as the other acids, but, like ammonia, was retained by the soil, so that if phosphate of ammonium were used in the experiment, no part of that salt, either acid or base, would pass out in the drainage. Potash also was retained. The function of arresting and retaining the valuable manurial materials, ammonia, potash and phosphoric acid is possessed in a greater or less degree by all soils, and, at all events in the case of ammonia and potash, appears to depend chiefly on the organic or humus substances present, which exert an attractive power on those bases usually likened to that exercised by animal charcoal,

and other porous substances, on various salts, alkaloids and colouring matters in solution. It is usually stated that no strictly chemical union takes place between the organic matter of the soil and the substances it arrests, but the writer considers that the separation undergone by the ammonium and potassium salts, into the acid which passes away, and the base that is retained is sufficient to prove that a definite action does take place, and that the ammonia or potash is retained in the soil consequent on forming an insoluble compound with some organic acid.

However, the exact way the ammonia becomes fixed in the soil is of little consequence, provided it only remained so until the nitrogen contained in it was taken up by the crop as required; but, it unfortunately happens that ammonia so situated speedily begins to change, and becomes oxidised into nitric acid, which then immediately unites with any bases it may meet with to form soluble salts or nitrates, that are readily washed out of the soil by the rainfall.

That ammonia was capable of being converted into nitric acid by natural agencies has long been considered probable from the observations that have been made on the formation of artificial nitre (or nitrate of potassium) by the decomposition of animal matters in the so-called nitre heaps, and from the frequent occurrence of nitrates (nitre-rot) deposited on the brick walls of stables where ammoniacal emanations abound. In fact ammonia has long been regarded as the penultimate, and nitric acid the final product of the putrefaction or decay of nitrogenous animal and vegetable substances. But a more especial agricultural interest was awakened to the

change that ammonia undergoes, by the experiments made at Rothampstead, which resulted in proving that nitrates enormously increased in drainage water from plots manured by sulphate of ammonia, and thus accounted for the loss of nitrogen experienced when ammoniacal manures were employed.

Previous to 1873, it was generally considered that the conversion of ammonia into nitric acid was effected by the direct action of atmospheric oxygen under the influence of porous substances, such as finely divided soil, charcoal, platinum black, brick, &c., which were supposed to act simply by their well-known power of condensing air within their interstices, and so bringing the atmospheric oxygen in a more concentrated, and presumably more active form, into contact with the ammonia. Since then, however, it has been indisputably proved that the change is due to the action of a living organism. PASTEUR, in 1862, first suggested this possibility on theoretical grounds, and A. MÜLLER in 1873 drew conclusions favourable to it from experiments on the difference in the behaviour of ammonia present in sewage and in pure water respectively; but it was reserved for SCHLOESING and MUNTZ in 1877 and following years, to firmly establish the fact. By a system of patient cultivation they succeeded in isolating the particular organism from numerous similar ones present in soils, and describe them as minute, round or slightly elongated corpuscles, existing singly or joined in couples, which apparently multiply by budding, and belong to the *bacteria* family. The temperature most favourable to their action is 37° C., or 98.6° F., and below or above that temperature their power rapidly diminishes. The

organism is so abundant that it is rare to find a particle of arable soil that is not effective in causing the conversion of ammonia into nitric acid.

Although no experiments have been made to decide the point, yet, it is to be expected that the waste of nitrogen that occurs when ammoniacal salts are used as manure, would approach its maximum in a country like British Guiana, where the rainfall is so constant and abundant, and the prevailing temperature not far removed from that at which the greatest activity is manifested by the nitrifying organism.

It was LIEBIG who first suggested the addition of sulphuric acid to ground bones used as manure to render them soluble in water and thus capable of more readily supplying plants with the phosphorus they require. The manufacturers carry out the suggestion by simply adding from 25 to 50 per cent. of sulphuric acid to bone or other phosphate, which is then, after a certain interval to allow of the action of the acid being complete, sold as superphosphate or "soluble" phosphate of lime at an increase of at least 75 per cent. on the value of the substance thus made soluble. Excellent results have frequently attended the application of this soluble preparation to root crops in Europe, but, on the other hand, instances are not wanting in which it has failed to realise the expectations formed of it, by showing the marked advantage over ordinary insoluble phosphate commensurate with its increased cost. In soils containing much lime or chalk, it is obvious that it must quickly revert to its original insoluble condition by the neutralization of the acid with which it is associated; whilst in soils containing ferric oxide, hydrate, or what is perhaps less

likely to be present, free alumina, it is especially liable to form insoluble compounds, which as manurial materials are considered to be practically valueless. Two reasons that should tend to limit the use of superphosphate in British Guiana, are, firstly, that being a powerfully acid substance in itself, it increases the already excessive acidity of the soil; and secondly, it is probably productive of great waste of phosphorus by forming the above mentioned inert compounds with the iron (and perhaps alumina) existing so abundantly in the clay soil of the colony. The validity of the first reason is self-evident, in support of the second, the following experiments recently carried out at the Government Laboratory may be submitted.

A sample of superphosphate was prepared by acting upon tri-calcium phosphate with half its weight of sulphuric acid. This was dissolved in water, and the solution diluted until 1000 parts contained 1 part of phosphoric acid in the form of superphosphate. There were also added to the solution, 10 parts per 1000 of crystallized sodium acetate to "destroy" any free sulphuric acid that might be present, and 20 parts per 1000 of glacial acetic acid to prevent any action of lime on the phosphate.

Experiment I.—500 parts of air-dried new soil from Pln. *Lusignan* were mixed with 1000 parts of the superphosphate solution. The mixture was made in a corked flask, and shaken at intervals for five days. The solution was then filtered off from the soil, and the amount of phosphoric remaining dissolved in it, determined. This was found to be only ·09 part per 1000, which, allowing for the water present in the soil (8·1 per cent.), showed

that 90·7 per cent. of the phosphoric acid present had been absorbed and fixed by the soil.

Experiment II.—was a repetition of the previous one, except that only 250 parts of the air-dried soil were taken with 1000 parts of the superphosphate solution. After five days the filtered liquid contained ·38 parts of phosphoric acid per 1000, which, corrected for the water already present, showed that 61·3 per cent. had been retained by that quantity of soil.

The proportion of phosphoric acid used in the above experiments, namely, 2 and 4 parts respectively to 1000 of soil, is, of course, far greater than would be used as manure, seeing that it would be about equal to the addition of 2 *tons* and 4 *tons* of the acid, or its equivalent in superphosphate, to an acre of soil 6 inches deep; whilst, in actual practice, 1 or 2 *hundredweights* would at the most be employed.

Notwithstanding the excessive proportion used, the results of the experiments prove, as was anticipated, that on bringing superphosphate into contact with certain soils, the greater part of the phosphoric acid present does enter into union with some constituent of the soil to form an insoluble compound; and this in spite of the presence of abundance of water strongly acidified with acetic acid. The full significance of this latter fact will be evident when it is understood that compounds of phosphoric acid that are insoluble in dilute acetic acid are considered to have no manurial value, as they likewise resist the action of the much weaker natural solvents in soil and thus prove incapable of supplying the phosphorus that plants require. For this reason, minerals consisting chiefly of phosphate of alumina and iron (which can be

obtained in immense quantities) are rejected as worthless by agriculturists, and even the mineral form of phosphate of *calcium*, has a much lower commercial value than the animal variety, in consequence of its less ready solubility.*

To ascertain the effect of hydrate of iron, alumina and lime on superphosphate, the following experiments were made with a sample of white, so-called pure clay, or kaolin, to which known proportions of the above substances were added.

Experiment III.—250 parts of dried kaolin were shaken in a corked flask with 1000 of superphosphate solution. After five days the filtered liquid contained ·92 parts of phosphoric acid per 1000, showing that only 8 per cent. of the acid had been removed by the clay. The latter was found on examination to contain a small quantity of iron, to which the loss of acid was probably due; practically, however, the clay had little or no effect in fixing the phosphoric acid.

Experiment IV.—250 parts of dried kaolin were well mixed with 5 parts of slacked lime, and shaken at intervals with 1000 parts of superphosphate solution. After five days the liquid contained ·84 of phosphoric acid per 1000, showing that 15 per cent. of the acid had become insoluble. The lime used was ordinary Bristol lime, and like the clay, it was also found to contain a minute quantity of iron. It is highly probable that if clay,

* "It is necessary to ascertain whether the phosphates are soluble in carbonic acid (calcium and other protoxides), and therefore assimilable by plants, or insoluble in carbonic acid (iron and other sesquioxides), and therefore non-assimilable. For analytical purposes, carbonic acid may be replaced by acetic." *Use of Superphosphates*, by J. P. DEHERAIN. *Journ. Chem. Soc.* Abstracts, 1884, 925.

perfectly free from iron, and pure lime were employed, no effect whatever would be produced on the superphosphate.

Experiments V and VI.—Hydrate of iron was prepared by adding ammonia to a boiling solution of ferric chloride. The resulting precipitate was collected, well washed with boiling water and dried at 100—110°c. It was then in the form of dark-red hard lumps, which were reduced to fine powder in an agate mortar. The powder dissolved only very slowly in cold hydrochloric acid, and was almost unacted upon by dilute acetic acid. Five parts of it were mixed with 250 parts of kaolin, and placed in a flask together with 1,000 parts of superphosphate solution. The mixture was shaken at intervals for five days and filtered. It was then found that the liquid contained only ·45 of phosphoric acid per 1000, or 55 per cent. had become insoluble. This experiment was repeated, and the mixture allowed to stand for 30 days with occasional shaking. The phosphoric acid in solution was thus reduced to ·38 per 1000, or 62 per cent. had become fixed.

Experiments VII and VIII.—Hydrate of alumina that had been precipitated from an aluminum salt was tried next. This substance had not been heated, but had become dry spontaneously by exposure to air for several months: it was in the form of very hard compact masses. After being reduced to fine powder, 5 parts were well mixed with 250 part of kaolin, and 1000 parts of superphosphate solution were added. After 5 days the amount of phosphoric acid remaining in the liquid was ·38 per cent. per 1000, or 62 per cent. had been removed. The experiment repeated, and the mix-

ture kept for 30 days, resulted in 67 per cent. of the acid becoming insoluble.

Time did not admit of any further experiments being made before this paper was in the hands of the printer, but additional experiments have suggested themselves which will probably be carried out subsequently. Sufficient has been done, however, to show that comparatively large quantities of costly superphosphate are easily converted into highly insoluble, and presumably worthless compounds by clay containing about 2 per cent. of oxide, or hydrated oxide of iron or alumina. It only remains to add that the cultivated soil of the colony contains from 2 to 10 per cent. of oxide of iron (if not free alumina), which is ordinarily present in the hydrated condition, and therefore in the form most readily acted upon by the superphosphate.

On proposed substitutes for sulphate of ammonia and superphosphate of lime:—There appears to be but little hope of increasing the per-centage of sugar in canes by means of manures, or, at all events by those at present employed. This is clearly evident from Mr. GILZEAN'S experiments at Pln. *Anna Regina*, (*Timehri*, V. 138.) Taking the first experiment in each of the two tables of results furnished by him it appears that with $60 worth of manure (acidulated and ammoniated guano) per acre, the total sugar in the canes produced was 17.36%; with $16 worth of manure per acre, the total sugar was 17.50%; whilst, without manure the canes yielded 17.91% of sugar in the first case, and 16.90% in the second. The only certain way of securing increased saccharine richness therefore seems to be by propagating the best individuals of the best varieties;

indeed, it would not be a difficult matter to select only the best joints of the best canes for that purpose.*

At the same time the influence of manures in increasing the yield of cane is also clearly apparent from Mr. GILZEAN'S experiments. Thus $60 worth of the above manure produced 30.6 tons of cane per acre, $16 worth produced 19.8 tons, whilst the unmanured land only furnished in one trial 15.2 tons, and in the other 14.4 tons! Apart, however, from increasing the yield of sugar or cane, a necessary function of manure is to supply the drain on the soil caused by the crop, and if manure is altogether withheld, exhaustion of the soil will ensue sooner or later, and the crops will languish and fail. Still this alternative may be of little moment, where abundance of new land is at disposal, although the question then arises, whether it is not more economical to keep up the fertility of the old soil, rather than prepare new as the other ceases to yield? Considering that sugar cane is one of the least exhausting crops, and that the value of the minerals removed by it is small, the former course seems preferable, and appears to be generally adopted in the colony. This being so, the point to be aimed at is to reduce the expense of manuring to a minimum compatible with efficiency, and, as already intimated, it is far from being even probable that the mark has been struck at present.

With respect to the supply of nitrogen to plants, numerous experiments have been made in Europe during the past few years, with the object of comparing the

* On purely theoretical grounds the writer anticipates that increased saccharine richness might follow the use of potassium salts as manure.

effects of various nitrogenous substances. As regards rapidity of action, nitrate of sodium takes the first place, sulphate of ammonium the next, then follow dried blood, flesh meal, steamed bones, horn and wool waste, the various oil cakes, and lastly old leather. In nitrate of sodium the nitrogen is in a condition directly assimilable by plants (that is in the form of nitric acid), whilst in the other substances it has to undergo certain changes to make it fit for the purpose. There being as it were only one step between ammonia and nitric acid, ammonium salts speedily undergo the necessary change, but as already explained, this is of doubtful advantage as the nitrogen is then too readily washed out of the soil by the rainfall. Sugar cane is a plant that developes in successive distinct portions,—every joint grows and matures independently of every other joint, and it follows that if a supply of nitrogen is required for the first, so equally is it required for the last. Therefore manures that yield nitrogen in an assimilable form continuously and gradually during the entire growth of the cane, would be the most suitable. Nitrate of sodium and sulphate of ammonium do not appear to fulfil this condition. It is well known that their action is energetic at first, but soon ceases, and this is probably in consequence of their speedy removal from the soil in the drainage.* On the other hand, animal and vegetable nitrogenous matters undergo conversion into nitric acid slowly, yet sufficiently fast to keep pace with the requirements of

* This rapid action has given rise to the curious notion that sulphate of ammonium acts as a "stimulant." But a young plant does not need a stimulant any more than a baby does; proper food only is required.

the plant, and their nitrogen being more or less insoluble is not so liable to waste; moreover, much of the excess not utilised by one crop may be counted on to remain in the soil to furnish nitrogen to subsequent ones* Dried blood contains almost as much nitrogen (about 14 per cent.) as nitrate of sodium ($15\frac{1}{2}$ per cent.) and in certain cases has acted as energetically. About half the nitrogen present in it is in the form of compounds soluble in water, the remainder being insoluble, but still capable of being easily converted into plant food. Flesh meal also contains about 14 per cent. of nitrogen, chiefly in an insoluble, but readily available form. The various oil cakes contain 4 to 5 per cent. of nitrogen; earth nut cake being about the richest, whilst hemp seed cake is said to act quickly, and linseed cake slowly. Mixed with an equal weight of slaked lime to cause more rapid decomposition, they should prove useful manures for soils deficient in organic matter, especially for burnt soil, which no doubt might be readily restored to fertility by their use. The nitrogen present in such substances, ought to be obtained at a lower price than that present in nitrates, or ammonia salts, so that if it proved to be equally efficient, a considerable saving not only from waste, but also in cost might be effected by their use.

* "In addition to the nitrogen removed in the crop, and to that lost by drainage, some small proportion is found by analysis to be retained in the soil itself. The nitrogen may be of advantage to crops grown subsequently, according to the source from which it is derived; for while ammonia salts and nitrates yield but very small residues, and exert but little or no effect beyond the first year, from bones, cake, and other such materials we get large residues of nitrogen in the soil, which tell markedly on future crops." Dr. VOELCKER in *Enclycopædia Britannica*. Last Edit. Art. *Manure.*

As regards phosphorus: since Mr. THOMAS JAMIESON of Aberdeen in 1876 attempted to prove "that soluble phosphates are not superior to insoluble phosphates to the extent that is generally supposed" and that even the purely mineral phosphates are capable of furnishing an adequate supply of phosphorus to plants, provided they are used in a sufficiently finely divided state, experimenters in England and on the continent have been engaged in testing the comparative merits of the various forms of phosphates.* It seems that superphosphate has yielded the best results in soils containing abundance of lime, but in soils deficient in that substance, and especially in those of a peaty and acid character, insoluble phosphates have proved to be as efficient as, and in many cases superior to, the soluble form.† In the one or two comparative trials that have been made in this colony, the efficacy of insoluble phosphate has also been established sufficiently well to warrant a continuance and extension of the experiments; considering the nature of the soil, favourable results may be anticipated in the majority of cases.

In England the cost of 1 lb. of phosphorus as superphosphate varies from $8\frac{1}{2}$d. to $10\frac{1}{2}$d. according as mineral

* Mr. Jamieson, in a recent paper replying to criticisms by Dr Voelcker estimates superphosphates as giving only ten per cent better results than finely-ground mineral phosphates.

† "It is more advantageous to apply insoluble phosphates rather than superphosphate to humous soils, as they are capable of bringing insoluble into a soluble condition; this applies, however, only to peaty soils as the presence of lime hinders this action." *Researches &c.* by A. Konig, R. Kissling and M. Fleischer. (*J. Chem. Soc.* Abs. 1883, 681.) On the influence of lime in soils on phosphates, see also B. Dyer (*J. R. Agric. Soc.* 1884, 113.)

or bone superphosphate is respectively purchased, whilst as insoluble bone phosphate it costs about 5½d., and as mineral phosphate only 2½d Probably quite half the money spent by the colony on manures goes in the purchase of phosphorus, it will therefore be seen what a large saving would be effected if insoluble could be successfully substituted for soluble phosphate.

Note on the Boundary of Berbice.

By Alexander Winter.

THE Guiana colonies were taken by the English in 1796 and were not restored to the Dutch till the Peace of Amiens in 1802.

The English did not remove the Governors at the time of the capture, but allowed them to govern the colonies for England. Governor FREDERICE in Surinam and Governor VAN BATTENBURG in Berbice, were both English Governors in 1800.

At that time the boundary of the colony of Berbice to the eastward was the Devil's Creek. The colony during the short occupancy of the English prospered considerably, and there was a demand for more land, and the tract between the Devil's Creek and Corentyne was becoming settled upon.

The Devil's Creek being a very insignificant boundary, it was proposed to make the River Corentyne the boundary between the two colonies; which, as both colonies belonged to the same Crown could easily be done. Governor VAN BATTENBURG went to Paramaribo to arrange the matter with Governor FREDERICE; and the arrangement then made between these two British Governors was confirmed by their respective local legislatures, or as they were then called "Councils of Government," in January 1800.

It was *not* a matter affecting the boundary of national territory—which of course would necessarily have been referred home to be made the subject of a treaty between

the Courts of St. James and the Hague—but a matter of local interest only such as the two Governors considered themselves competent to settle themselves. This they stated in the preamble to the arrangement they made.*

Nothing can be plainer than the fact that this "arrangement" as it is called, had nothing in it of a nature binding upon two distinct National Powers, but was simply a shifting of the land-marks dividing the territory of one and the same owner and placing the settlers on the lands between the Devil's creek and the River Corentyne under the Government of the colony of Berbice, and they were thenceforward to be considered inhabitants of Berbice.

The colony of Berbice having been restored to Holland by the Treaty of Amiens in 1802, was again captured by England in September 1803, and in the Act of Capitulation there is the following reference to the arrangement of January 1800:—

ARTICLE 2. The grants of land on the West Coast and West Bank of the Corentyne, made by Governor Frederice of Surinam, which territory was formerly held to make part of and belonging to that Colony, but since December 1799 has been placed and considered as belonging to the Government of Berbice, shall in the same manner as proposed by the preceding article be respected as conclusive. . . . . . .

"ANSWER IN ARTICLE 10."

This Article 10 refers to grants of land to private individuals; and the words of the answer are "Left for "future investigation, and if found to have been fairly "obtained, will be confirmed."

It is under this article that the present Dutch Government claim the sovereignty of all the islands of the

* See the translation of it in McDERMOTT's "Laws of British Guiana," Vol. 1. page 51.

Corentyne (and the waters of the river to low water-mark on the British side) and also the "Post establish-"ment on the West Bank of the River Corentin" as mentioned in Article 4 of the Agreement of January 1800.

But this article of the Act of Capitulation confirming the grants of land to private individuals who had already settled upon them and commenced cultivation on them cannot be held as confirming the principle of fixing a boundary line between two countries now no longer belonging to the same Crown but to two distinct, and at that time hostile, nations. The boundary line between British Guiana and Dutch Guiana must, therefore, follow the rule of all international boundaries where the territories are separated by a river; that is to say, it would be formed by an imaginary line following the main channel of the river; the islands on each side of the line would be allotted to the respective countries, and such islands as are intersected by the dividing line must be allotted to each country alternately.

As to the Post on the west bank of the river, supposed to be at the Chalk Hills, no act of capitulation could assign over to a hostile nation one of the military posts. This idea is absurd. Two English Governors of adjoining colonies may find it convenient to place the control of two Posts immediately opposite each other but on different sides of the river, under the charge of one Postholder, but no officer commanding a victorious fleet, would admit an article in the act of capitulation which reserved to the enemy the occupancy of a Military Post. The thing is impossible, indeed the very first clause in the act of capitulation says—

"Sovereignty of the Colony with its Forty *Posts*, artillery and am-

munition of War, will be surrendered to his Britannic Majesty's Forces on the capitulation offered, and the following additional articles."

And one of these additional articles is as follows—

ARTICLE 4. The Troops of His Britannic Majesty shall garrison all existing Island Posts for the protection of the Colony against insurrection of the Negroes; and as many more Posts shall be created for that purpose as in future may be deemed necessary.

The object of this proposed article appears to be to secure the safety of the colony internally by obtaining a pledge from the captors that they would keep up such Posts as the one on the Corentyne which they in their answer promised to do. What the Dutch asked was, not that the Post should be left in their possession, but that the English should garrison it.

There may have been such a Post on the West bank of the Corentyne River but there is none now and no traces of any fortifications. The one alluded to in the deed of arrangement of 1800 is probably the one marked in an old map of 1770, Buyten Post van de Corentyn—Ephraim—and immediately opposite on the side of the river is another Post marked "Aurearis."

We learn from HARTSINCK whose History of Guiana was published in 1770 that there was on the "Wederzyde" of the river a Post of ten or twelve men placed under one sergeant.

One Post he says was called Aurearis (*Anglice,* Orealla) and the other Ephraim; according to the map, Post Ephraim is on the British side and Post Aurearis is on the Dutch.

It is quite reasonable to suppose that the two British Governors in 1800 when making a joint arrangement of the affairs of the two colonies would not think it worth while to have these two petty posts under different go-

vernments and therefore left the men at Post Ephraim under the charge of the sergeant of Post Aurearis.

This is a very different thing from leaving a Post upon British ground to be garrisoned by a Dutch force. And practically both Posts have been for years abandoned.

There has however been a Post Holder maintained by the English at the Chalk Hills, who had more or less charge of the Indians; and the English Governors went up there every year, with some state, to distribute annual presents to their Indian allies. But no such visits have been paid by the Dutch Governors to the opposite side.

Article No. 2 in the Act of Capitulation though it confirms to the holders of grants of land as made to them by Governor FREDERICE the right to be considered as inhabitants of Berbice yet says nothing about the islands in the river and nothing of the Post established on the west bank. This Post whatever it may have been was of course included in the general surrender of the colony with its Forts, Posts, &c. as stated in the Act of Capitulation and it has been in the possession of the British since 1802. The Post was originally a Mission station of the Moravians who gave it the name of Ephraim about the year 1758 but it figures in HARTSINCK'S Map as a Military Post with a flag flying over it. It is probably the spot where for years a British Post Holder resided and where the British flag used to be hoisted by him on the occasion of visitors coming there.

The Post at Orealla has not been a Military Post for at least 50 years. In HARTSINCK'S map it is marked as a Military Post, but on the large map of Surinam published by authority in 1847 it is marked simply as an "Indian settlement" and this is its true character.

On referring to the Treaty of Peace signed at Amiens, 25 March, 1802 by which the conquered colonies were restored to their previous owners the boundaries between Berbice and Surinam are not mentioned; but there is a special clause fixing the boundaries between French, and Portuguese Guiana, the principle of which would apply to the Corentyne.

Article 7 of the Treaty of Amiens, says—

"The territories and possessions of his most Faithful Majesty are maintained in their integrity, such as they were antecedent to the war. However, the boundaries of French and Portuguese Guiana are fixed by the River Arrowary, which empties itself into the Ocean above Cape North.

"These boundaries shall run along the River Arrowary from its mouth to its source and afterwards on a right line drawn from that source to the Rio Branco towards the West.

"In consequence, the northern bank of the river Arrowary from its said mouth to its source, and the territories that lie to the mouth of the line of boundaries laid down as above, shall belong in full sovereignty to the French Republic."

"The southern bank of the said river Arrowary, from the same mouth and all the territories to the south of said line, shall belong to His Most Faithful Majesty."

"The navigation of the river Arrowary along the whole of the course shall be common to both nations."

And why should not the navigation of the river Corentyne be "common" to both British and Dutch Guiana? Why should the navigable portion of the river be called *Dutch Waters?* If the claim is founded on the arrangement between Governors BATTENBURG and FREDERICE in 1800, it must be abandoned; for that was not a treaty between two nations, but an arrangement for the regulation of two colonies of the same country.

Occasional Notes.

Cultivation of Artificially Coloured Feathers.—The curious habit, practised by several uncivilized peoples, chiefly, it is believed, American, of altering by artificial means the colour of the feathers of living birds, or rather of causing the growth of feathers of an unnatural but desired colour, is deserving of more attention than it has yet received. The first step toward the requisite examination must be by collecting the recorded notices of the practice. Very few such notices are known to me; and, living far from all libraries, I am unable to search for more. I wish, therefore, here to call attention to the subject, and to invite correspondents to send me any notices of the practice with which they may meet. My own few contributions, to form a nucleus for the collection, are as follows:—

1. HUMBOLDT in his "Personal Narrative"* notes a curious instance met with by him on the Orinoco. He writes:—

> "In going to the *embarcadero*, we caught on the trunk of a hevea† a new tree-frog, remarkable for its beautiful colours; it had a yellow-belly, the back and head of a fine velvety purple, and a very narrow stripe of white from the point of the nose to the hinder extremities; this frog was two inches long and allied to the *Rana tinctoria*, the blood of which, it is asserted, introduced into the skin of a parrot, in places where the feathers have been plucked out, occasions the growth of frizzled feathers of a yellow or red colour."

Two points in this instance require notice. In the first place, the alleged *frizzling* of the feathers, as an

* Vol. 2. Chap. xxi. p 313, (BOHN's Edition).

† The genus *Hevea* consists of certain caoutchouc-producing trees, the best known of which are *H. Brasiliensis* and *H. Spruceana.*

effect additional to, and distinct from, the modification of their colour, has been heard of by me only in this case. Secondly, we have evidently to do here with a belief referable to the old 'doctrine of signatures,' the doctrine that taught that certain external marks evident on any object, plant, animal, or other, indicated the possession of certain internal characters by that object. A well-known illustrative case of this doctrine is that of the pretty little English field-flower called eye-bright (*Euphrasia*), which 'is supposed to be good for the eyes, on the strength of a black pupil-like spot in its corolla.' In our present case, the 'signature' on the frog is its bright colour, which is evidently regarded as the outward and visible sign of certain internal qualities; so that a little of the blood of the frog inserted, by a sort of process of inoculation, in the body of a bird will, it is supposed, produce the same external sign, that is brilliancy of colour, in the new feathers of the latter. This doctrine of signatures is important to our present purpose as it probably explains, as will presently be shown, many, though not all, of the facts observed in the artificial production of colour in feathers.

2. The next instance to be mentioned is one to which I have already alluded in an earlier volume* of *Timehri*, where is told that I myself found the Macoosis, here in British Guiana, in the common possession of birds with altered plumage, and that the owners asserted that they produced this effect, caused yellow feathers to grow, in place of red, green, or blue, on parrots and macaws, by plucking out the natural feathers, rubbing the part of

* *Timehri* Vol. 1. p. 28.

the skin from which these were torn out with the red dye-stuff called faroah, and making the birds drink water in which more of this faroah has been dissolved. This faroah, the produce of the pretty shrub *Bixa Orellana*, and known in the West Indian islands as *roucou*, in Europe as *arnatto*, is the, slightly orange, red dye so largely used by the Indians, especially the Caribs, to paint their own bodies. It therefore seems not improbable that in this case also the fanciful means employed to change the colour of the feathers are in accordance with the doctrine of signatures.

3. There is a passage in Mr. WALLACE'S "Travels on the Amazon and Rio Negro" (p. 294), a book to which I have not access at the present moment, which records the practice of this feather-culture somewhat further south than Guiana. Mr. E. B. TYLOR,* quoting this instance from the Amazon, says that the method there is 'by plucking the feathers and rubbing some liquid into the skin, it is said the milky secretion from a small frog or toad.' And the latter writer immediately adds,—'This is done in South America, but, so far as I know, not elsewhere; and it seems reasonable to suppose that it was invented there.'

I have now mentioned the only three recorded instances of this practice known to me. There are, however, a few more words which have still to be added on the general subject.

First, as to the once presumed purely American origin and practice of this kind of feather culture. Mr. TYLOR, since the publication of the passage just quoted from him has, he informs me in a private letter, found reason to

* 'Early History of Mankind.' London, 1878. p. 177.

modify his view. 'The last evidence I have met with,' he writes, 'has almost made me change my mind about its being a native American invention; it seems more likely to have come from Africa with the negro slaves.' I presume, though he has not told me so, that he has met with evidence of the practice in Africa. But even if this is the case, I should *prima facie* be inclined to believe that the custom has originated separately in the two places. For, in the first place, the fact that, as above related, I found the practice in a remote part of the Macoosi country, where probably no negro had ever been before about 1830, and where but few have been even since that date, makes it unlikely that the practice was in that instance of African origin. And, in the second place, a far more important consideration is that the practice if carefully examined appears to be so simple, and to be founded on such a natural and simple idea, that it would rather be the more wonderful thing if it had not originated more than once, and in several parts of the world, than that it has so originated.

In analyzing the practice of this artificial feather-culture the chief points to be first considered are that, as I can myself vouch, modification of the colour of the feathers is really and actually effected, but that this is effected, *not* by the means purposely taken to attain the desired end, *but* by accidental circumstances unintentionally, but simultaneously, presented.

We may take for granted the first of these points, that the change is really effected. As regards the second, that the means taken are not those really effective, it may I think be inferred from the instances above quoted, and the same inference will I believe be deducible from

any other instances which may be brought forward, that these intended means—of course I am here referring only to artificial feather-culture as practised among primitive folk and not to an instance of a somewhat analogous practice, to which I shall presently refer, among civilized people—are all based on what has been described as the doctrine of signatures. The idea that the bright colour, or any other quality, of one animal or inanimate object, may be imparted to another by inoculating the second with whatever may be deemed the most essential part of the first is so very simple and natural that it must occur, and prevail largely, even in very primitive minds, and must indeed form one of the few earliest and simple factors by the combination of which the primitive man forms his small stock of secondary ideas. Granting, as surely may easily be granted, that the primitive man, in whatever quarter of the globe he may be situated, desires feathers of a colour, or a brilliancy of colour, not easily obtainable in feathers but evident to him in some other object, his very natural idea is to attain his end by imparting some portion of the virtue, and with the virtue the desired and, as he supposes, correlative quality of the latter object to some bird which shall produce for him feathers with the desired quality. So, desiring feathers of unnatural brilliancy, he removes the natural plumage and rubs into the skin, into the wounds produced by this tearing out, some such matter as the blood, or some other secretion, of a brilliant-coloured frog or as the bright-coloured body paint which he himself uses so frequently for other purposes. In short, the practice may, and is very likely to, originate any number of times and in any number

of places, provided only that the people among whom it originates are sufficiently primitive to be ignorant of the real absence of relation between the special cause and its effect assumed in any application of the doctrine of signatures.

But, as it is of course obvious that inoculation with the blood of a bright-coloured frog, and it is, to say the least, probable that inoculation with faroah, cannot produce the desired brilliancy in the feathers of the bird, the fact that this brilliancy really is attained has to be explained. The explanation seems to me to be, that the bird can only be subjected to inoculation, or at least that the changes in the bird after inoculation can only be observed and known, when it is more or less in a state of captivity, or rather of tameness, for Indians seldom, if ever, long shut up their numerous birds in cages; that in this tame state the bird wanders about the Indian's house and feeds itself on scraps of meat, fish and other such food unnatural to it; and that this unnatural diet, or some of its constituent parts, is that which really effects the change in colour. What the special efficient food is is not certain; I have heard it asserted, and I think not without reason, that it is salt. It must be here noted that, as far as my experience goes, and Mr. TYLOR—the only other person known to me who has alluded to this special point—seems to make a similar statement, the only colour artificially produced is yellow, either pure yellow or reddish,—yellow passing to orange. Nearly every one of the many, naturally green, parrots seen about Indian settlements has unless it be quite young, a greater, or less number of abnormal yellow feathers, and instances are on record, one has

come under my own eyes, in which the entire plumage had turned to yellow; but I feel quite satisfied that but *very* few of these have been treated with frog's blood, with faroah or with any substance of similar purpose. On the other hand, among the numberless parrots of this same kind which are bought while still young from Indians and introduced in cages, or in some sort of confinement, into civilized life, it is very rare to find any which have yellow feathers, or at least which *after being caged* produce more yellow feathers. It is, I think, therefore, obvious that this yellowing is caused by some of the conditions under which the birds live while in the semi-captivity imposed upon them by their Indian masters; and it is, I also think, more probable that the efficient condition lies in their ordinary food than in any special application intended to change the colour. That the Indians when they do happen to have made such an application should see in the yellowing the result of this action of theirs, is not discordant with the habit of thought of uneducated men all over the world; nor is it discordant with that habit of thought that they often have under their eyes, without drawing logical inferences from, cases in which they see the effect, the yellow colour, come where there has been no application of the cause which they suppose to be the necessary antecedent.

Lastly, it will be as well to notice that, as has already been indicated, a somewhat analogous practice to this feather-culture of savages takes place, commonly enough, among our own civilised selves. At any ordinary bird-show, canaries of a special breed the chief point and excellence of which is, I believe, the altogether un-

natural red, or rather orange colour, are shown. Mr. TYLOR has been good enough to procure for me, from a friend of his who is a noted breeder of these canaries, the following particulars of the process employed :— "Commence," he writes, "the process three weeks "before the bird is likely to begin changing his plumage, "in order that he may become thoroughly accustomed to "the food, and his system may be well saturated with "it. At first mix in equal proportions cayenne, sweet "biscuit-powder, and hard-boiled yolk of egg. The egg "must be grated as fine as the other ingredients, or the "bird will pick it out and leave the cayenne. Take away "all the other food until the bird eats the cayenne readily, "and only give a very few seeds until he begins to "moult, when the red food should be given only, and "the proportion of cayenne raised to quite one-half. "Take care not to revert to ordinary food until the new "feathers are thoroughly grown. The small head-feathers "will not be quite *opened* till three weeks after the last "feather drops, though the period varies in length, and "probably would be more rapid in the tropics. I should "say that it takes about 6 ounces of cayenne pepper to "moult a canary. The cayenne pepper sold by grocers "is never bright enough in colour. The pepper used "for birds is called 'Natal pepper.'"* Mr. TYLOR adds that his friend has recently tried a special preparation, called 'canaryper,' which is cayenne with the heat extracted from it, and has found it as efficacious as the hot pepper.

This last information naturally suggested to me the

* Is not this the 'Nepaul pepper' recently introduced but now flourishing in this colony ?—E. F. I.T.

thought that possibly it is cayenne pepper, that is, the fresh red peppers so abundant and important an article of diet with our Indians and growing so abundantly round the houses of these people, that bring about the yellow colour in the feathers of the domestic parrots of an Indian Settlement. There is, however, a great difficulty to be explained before accepting this otherwise very probable suggestion; which is that, red peppers being almost as abundant in the civilized as in the Indian houses of this colony, our caged parrots often get almost, or quite as much of this food as do the Indian's parrots, and yet, as I have already said, our birds seldom if ever seem to change colour. In my own aviary, containing among other birds, several parrots, it is not unusual for three or four pounds of red peppers to be consumed in a week; yet none of my birds have changed colour.

While I write this I am preparing to journey once more into the country where special but probably mistaken means are taken for feather culture, and I hope to be able then to acquire further information; and when I come back, and am once more settled, I hope, if I am able to bear the infliction, to keep several parrots in separate cages, and to experiment on them with various kinds of food.

A Point in the Psychology of Ants.—Many observers of ants have noticed that ants are able to distinguish whether other ants, of the same species, are from their own, or from foreign colonies, and that they welcome or shun, or even attack, these according as they are fellow-colonists or not; and most of these observers have expressed their inability to explain the mode of this

recognition. Among the latest writers on this point is Sir JOHN LUBBOCK in his "Ants, Bees and Wasps." Though hesitating to make the suggestion to so wonderfully close and acute an observer, it has yet occurred to me as possible, it seems to me even probable, that this recognition by ants of their fellows and their hostility to all whom they do not so recognise is merely the exact parallel of the similar habit of the members of a more or less small tribe of primitive men.

It may perhaps readily be granted that each ant expects to find in each other ant with which it meets a being exactly similar to itself. And it will probably also be granted that when it meets an ant of another species, or, still more, another genus, than its own it at once, seeing those differences which are so very obvious even to our coarser eyes that we are able to pronounce the distinction of the species or the genera, regards it as a thing to be dreaded, an enemy, and at once attacks it. But it will not be so readily granted that when an ant meets another of its own species but from a distant nest, or from a nest near, but not the same as its own, or from its own nest from which it has been for some time removed by some such external circumstance as an experiment-loving Sir JOHN LUBBOCK, and is, in the respective cases, hostile, not hostile, or even disposed to be affectionately friendly that the particular line of conduct which it adopts is dependent on its recognition in the new-comer of but a very distant similarity, or a closer similarity, or a very close similarity, to itself. It may be that the qualities which it looks for in the newcomer are such as it detects, if present, by smell, or it may detect them by touch or by hearing, but more pro-

bably by sight. For each of its senses is probably much more minutely acute than the corresponding senses in ourselves; so that it distinguishes differences far too minute to be distinguished by us. It is said—I don't know on what authority—that the difference of facial expression in a flock of sheep, even if all are of the same breed, are as marked in each individual as they would be in an equal number of human beings. The shepherd, too, knows each sheep of his flock by its facial expression—not, it may be, in a flock maintained on the modern system by the constant importation of new and better blood, but in the old-fashioned flock in which generation uncrossed succeeded generation. Nor is it too much to suppose that the sheep, thus able to distinguish each individual of its fellows by the family features, is also able to recognise certain, also minute, features common and peculiar to the family; so that, on seeing a sheep of its own flock, or at any rate of close kindred with itself it can recognise the kinship and express its recognition at least by not evincing the aversion which it would show to a strange sheep of less close kinship.

And so it is with men. In modern civilized society the intermixture of various men, and their going and their coming, is so complex that it is quite easy to imagine—perhaps many will even be able to mention particular cases—in which a son might not recognise at first sight his father, or a brother his brother; but critics would undoubtedly dwell on the improbability of the plot of that novelist who should represent a son failing through a long period to recognise the relationship of his father, or a brother the relationship to his brother. But

in uncivilized societies, where each tribe keeps apart from all other tribes, and where, even within the tribe, each family keeps more or less apart from all other families, each member of that tribe or that family is in a position at once to recognise any one of his fellow members, even though, owing to some purely accidental circumstance, he may never before have seen that fellow member, or may not have seen him for a more or less considerable time.

And as it is with societies of men, so it probably is, making due allowance in each case for the respective comparative acuteness of the perceptions, with communities of sheep or, to go still lower, of ants. In short, it seems not improbable that ants recognize other ants of their nest because they actually perceive in them the characteristic family features.

The "Spanish Arawaks" of the Morooka.—In an earlier number of *Timehri* (vol. ii. pp. 108, 221 & 236) mention has been made of the curious and interesting group of people, known as Spanish Arawaks, who exclusively occupy the Morooka river above Warramoori. Mr. McCLINTOCK has lately been good enough to give me an account, derived from his long and close experience of that district, of the history of this people; and as their history seems to me to be very different to what I had supposed and to form a curious and remarkable episode in the history of the colony, I transcribe it for the benefit of the readers of *Timehri.*

"It was," Mr. McCLINTOCK writes, "during the war "of independence in Venezuela that the Spaniards the "fathers of the present Spanish Arawaks of the Rio

"Moruca abandoned all they possessed on the Orinoko "(not wishing to fight) and sought protection under the "British Crown. Most of them, leaving their homes in a "hurry and in very small corials, were obliged to leave "their wives and families behind them and reach-"ing the Moruca by the inland navigation,* they "lost no time in reporting their arrival to General "D'URBAN, the then Governor of British Guiana†. His "Excellency, it is almost unnecessary to say, became "more than anxious at having so many persons to pro-"vide with employment and lands to suit their wants; "and it was not until after much delay that the high-"lands of the upper Moruca river were assigned to them. "These lands were selected for the following reasons; "the soil was rich, gravelly, and suited for the cultiva-"tion of coffee, cocoa et cet; the river abounded with "fish and the forest with game; and, moreover, the "river being a highway to the Orinoko, would afford "these Spaniards frequent opportunities of communi-"cating with their relatives and friends, most of whom, "as I have said, were left behind in the Orinoko, to "take care of themselves as best they could. As there "was no chance of their wives following them to the "Moruca, these Spaniards sought wives from amongst "the Indian women of the Arawak nation; and they "thus became the fathers of the present Spanish-"Arawaks of the Sta. Rosa Mission."‡

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* An account of this 'inland navigation' will be found in *Timehri*, vol. ii. pp. 219–230.—ED.

† Major-General Sir Benjamin D'Urban became Governor of Essequibo and Demerara in 1824 and of British Guiana in 1831. He ceased to hold office in 1833.—ED.

‡ That these Spanish Arawaks have become so distinct and exclusive

"Owing to the suddenness of the arrival of so many "persons to seek employment in the colony, His "Excellency was much perplexed for a time. But "the difficulty was overcome when several mana-"gers of coffee plantations agreed to employ a "few of the Spaniards; others, who had some "knowledge of horses, were engaged as grooms; "others as cooks; and others again were sent "to the Essequibo Coast to weed the public roads and to "cut cord-wood for the plantations. A few who were "still undisposed of, were taken over by WILLIAM HILL-"HOUSE, a gentleman well-known as a clever writer. "HILLHOUSE employed his Spaniards to fish with a "seine, and always accompanied them on such excur-"sions. The seine was long enough to reach across "the rivers Waini and Barima. Mr. HILLHOUSE having "taken great interest in the Spaniards, these looked up "to him as their chief; and to this day his name is "almost adored by every Spanish Arawak in the Moruca "river. The Spaniards who came from the Orinoko "were a hardy set of fellows, civil, industrious, obliging, "and frugal, and much liked for their general good "qualities."

"It must not be forgotten that the fathers of the pre-"sent Spanish Arawaks were a perfectly civilized and "Christian people before they came to British Guiana, "and it is only natural that their descendants should "have imbibed some of their good qualities. Moreover, "they had for years the benefit of a resident clergyman,

a group is probably due to their isolation as the only Roman Catholics among many Protestants, and to their curious retention of Spanish as their language.—ED.

" the Rev. JOHN CULLEN,* who lived amongst them for " nearly 20 years, caring for them in health and " in sickness, and never allowing their Christian princi- " ples to flag. Father CULLEN'S generosity was well- " known. He would want himself, to assist another; " and, in short, he was generous to a fault."

" The Spaniards, on getting possession of their " new lands, turned the Moruca hills to profitable " account by planting coffee, cocoa, fruit-trees, various " kinds of ground possessions, and also tobacco—which " they made into cigars."

" Their present church, at Sta. Rosa, is as neat and " substantial a building, for its size, as any in the colony. " The materials used in its construction are of the very " best, and were all brought to the spot by the Indians " of the Mission, free of expense. The present priest, " Father MESINI, has bestowed untiring energy and " personal attention in having the church erected and " the surrounding grounds planted; but his time is much " occupied with his other work on the Essequibo coast."

In answer to a request addressed to him for further information on this point, Mr. MCCLINTOCK writes to me—

" I am unable to tell you the exact time the Spaniards " arrived in the Moruca; but I know that in 1821-2 " small numbers arrived there, and from that time up " to 1829-30, they increased considerably. I hold a letter " written by one SMITH, a traveller, dated the 15th of " April 1829, in which he states that he has obtained " the services of JUAN, Captain of all the Spanish " Arawaks in Moruca, to convey him to the Wynie

* Father CULLEN is still living in England.—ED.

" River; and this proves that Captain JUAN had already " settled,—his settlement being at Coomaka, where HILL- " HOUSE also resided."

Census of the Indians of the Pomeroon.—Mr. MC CLINTOCK has kindly given me the following census of the various tribes of Indians living on the Pomeroon River in 1871 and again in 1881. The document is interesting as showing the relative numbers of the various tribes, though on account of the difficulty of enumerating so scattered a population, the actual numbers given are probably below the truth.

Census of all Aboriginal Indians living on the Pomeroon River and Tributaries, including Tapacooma Lake, taken the 3rd day of April, 1871.

TRIBES.	Males.	Females.	Total.	Grand Total of the Population.
Caribs	240	228	468	
Arrowacks	286	277	563	
Accoways	60	60	120	
Worrous	143	126	269	1,420
	729	681	1,420	
Negroes, Coloured Portuguese and Whites				673
				2,093

Census of all Aboriginal Indians living on the Pomeroon River and Tributaries, including Tapacooma Lake, taken the 3rd day of April, 1881.

TRIBES.	Males.	Females.	Total.	Grand Total of the Population.
Caribs	228	207	435	
Arrowacks	299	308	607	
Accoways	73	66	139	
Worrous	130	102	232	1,413
	730	683	1,413	
Negroes, Coloured Portuguese and Whites				1,007
				2,420

Scraps of Colonial History.—The editor of the "Argosy," having lighted on a complimentary reference in MURRAY'S "English Literature" to a forgotten literary clergyman of Berbice, asked for further information about this Rev. F. WHITFIELD. The enquiry has elicited the following characteristic scrap of colony history :—

I believe it was in 1812 that the Rev. F. WHITFIELD began to officiate as the English Church clergyman at New Amsterdam, and continued to do so until 1816, when he resigned in consequence of a conflict of opinion between himself and Governor BENTINCK as to the rights and privileges of the English Church, Governor BENTINCK being an adherent of the Dutch Reformed Church. I have been informed that the dispute was one respecting marriage, and arose with Dominie SCHIDIERS.

In 1822, however, the Rev. R. AUSTIN, who succeeded, having become extremely unpopular in consequence of his advocating the cause of SMITH, the missionary, resigned, and went to live in Surinam ; and Mr. WHITFIELD was again appointed chaplain. Those whose recollections carried them back to those prehistoric times have reported that he was a splendid reader and very gentlemanly in his manners. He was, moreover, a most graceful rider, having been originally, so it was said, a Cavalry officer.

It must be remembered that the colony church in New Amsterdam was not built until 1820, and that the English congregation till then had the privilege of worshipping in the Lutheran Church ; but Mr. WHITFIELD, for some portion of his time, at any rate, performed Divine service in a dwelling house. One service a Sunday then satisfied the religious appetite of the colonists and the conscience of the clergyman. *That* having been performed, Mr. WHITFIELD is said to have retired, with certain members of the congregation, and relieved the tedium of the Sabbath with a game of billiards. If no one accompanied him he still indulged in his favourite amusement by himself. In the evening he rode out to Vryheid, the magnificent mansion of Mr. KATZ,—an extensive proprietor, and had a rubber of whist.

Mr. WHITFIELD resigned in 1829 and was succeeded by the Rev. ROWLAND. It was rumoured that he declined to comply with Bishop COLERIDGE'S directions to the clergy to provide instruction for the

negro slaves, according to the wishes of the Home Government. He is reported to have said that he came to preach to gentlemen, not to niggers.

Another somewhat similar scrap, but referring to a considerably later period, we take from the Holy Trinity (Essequibo) Parish Magazine. It is as follows :—

We have among the Church records many interesting papers and valuable information. It would appear from these records that in 1834 the vestry decided to enlarge the Church, " by the erection of a couple of galleries on the north and south sides of the Church for the slave population "—and in a petition to the Court of Policy for funds, we have the following : " That latterly the attendance of the slave population at Divine worship has so considerably increased as to demand additional accommodation. That numbers have for many Sundays been unable even to get admission within the walls of the Church, and have consequently returned home, fatigued with perhaps a long walk, and without the comfort of a participation in Divine worship ; also that the Church being exceedingly crowded much inconvenience has been endured by the white population, whose very small proportion of the Church has been necessarily still further circumscribed, while, at the same time, a third part of the slaves who have been able to obtain admission within the Church have not been accommodated with sittings during Divine service." The result of this petition was the granting by the Court of 2,200 guilders for the galleries, and 1,500 guilders for general repairs. But the most striking paper which we have met with was a petition from the *apprentices* which gave a considerable trouble at the time. The petition is addressed to the then Rector—whose name is still green in the Parish, the Rev. DUKE—and to the members of his Vestry. The petition is remarkable in many particulars. We will only quote one clause of it :—" That your memorialists acknowledge with the greatest thankfulness the kindness of the Vestry in the late increase of accommodation for apprenticed labourers by the erection of galleries in the Church, by which means your memorialists have had a considerable increase of room ; but as room is still wanted and as your memorialists are well aware how heavy the expenses of their employers and masters are, as also to what great expense they have already been in building the Church, your memorialists do humbly desire to show their good will by *dedicating some of their first fruits of their extra time to the enlarging of the Parish Church, and humbly trust the vestry*

will allow them to subscribe such a sum as their means will admit, which they trust will be sufficient to make such additions to the Church as are required and the Vestry shall in their wisdom see fit, and your petitioners as in duty bound will ever pray."

Then follow the signatures—which, by the way, are generally Christian names only. Passing strange it is to find that, with one exception, the members of the Vestry would not allow the apprentices to pay anything—owing probably to some prejudice—and we gather that there were some lively meetings on the subject. Things were carried to such a point that the Governor had to interfere—who took the Rector's and apprentices' side.

Artificial Mound behind Pln. Leonora.—The Hon. WILLIAM RUSSELL informs me that he has lately found in the bush behind Pln. Leonora, 'an artificial raised way which has no connection with any thing else'. He adds that he has been informed by an old negro that the people used to raise such mounds, and to grow yams and cassava upon them in the wet season, when the country was under water. Mr. RUSSELL suggests that the mounds behind Enmore, on the East Coast, of which I gave an account in the previous number of *Timehri*, may be of similar origin. While fully alive to the interest of the Leonora mound, supposing it to be that which Mr. RUSSELL assumes, I cannot agree that the Enmore mounds, which contain much pottery of distinctly Carib origin, can be, whatever the Leonora mound may be, of African origin.

Local India-rubbers.—It may be remembered that some time ago Mr. JENMAN procured an analysis, and estimate of the value of, a new India-rubber from the Pomeroon River, described under the two names of *Touckpong* and *Coomaka-balli*. It has now been ascer-

tained, as I have long suspected, that these two names refer to totally different plants. The name *Coomaka balli* the Arrawaks apply to a *Ficus*, or perhaps to several species of *Ficus*. *Touckpong*, on the other hand is the (True Carib ?) name for a tree which has now been identified at Kew as *Sapium biglandulosum*, and it was from this tree that the rubber sent home by Mr. JENMAN under the name of *touckpong* or *coomaka-balli* was derived. It is a remarkable fact that, now that his attention has been attracted to the tree, Mr. JENMAN finds that the tree is very common about the cultivated coast lands and even in the Botanical Gardens. It should be added, however, that Professor OLIVER regards the Pomeroon tree as different from that of the coast land. If the latter is the true *S. biglandulosum*, perhaps the former should be regarded as a variety of the same species.

Balata.—The following correspondence on the subject of the commercial value of Balata contains much important information :—

Government Secretary's Office, Georgetown, Demerara,
9th September, 1884.

Sir,—I have the honor by direction of the Governor to forward for your information copy of a letter from Kew Gardens to the Colonial Office, with its enclosures relative to the commercial prospects of Gum Balata.

I have the honor, &c.,
J. FRANCIS VILLIERS,
Acting Government Secretary.

E. F. im THURN, Esq., S. M., Pomeroon.

Kew Gardens to the Colonial Office.

Royal Gardens Kew,
August 1, 1884.

Sir,—The Botanical Department, Demerara, having applied to this

establishment for information as to the commercial prospects in this country of Gum Balata, I have obtained from Dr. HUGO MULLER, F.R.S., the enclosed report upon the subject.

I am desired by Sir JOSEPH HOOKER to transmit a copy of this interesting document to you in order that it may be brought officially under the notice of the British Guiana Government.

The development of the trade in this interesting product seems entirely to rest with the colony.

The British Guiana Government will no doubt be so good as to furnish copies of Dr. MULLER'S letter to Mr. JENMAN and Mr. IM THURN.

I am, &c.,

W. T. THISELTON DYER.

EDWARD WINGFIELD, Esq., Colonial Office.

13, Park Square East, Regent Park, N.W.
July 31, 1884.

BALATA.

My dear THISELTON DYER,—Although my own opinion about Balata, derived from personal experience of its practical application in a few instances, was entirely favourable, I thought it desirable to avail myself of an opportunity of obtaining a further opinion, direct from an India Rubber manufacturer, considering that this would be much more to your purpose than anything I could say on my own account. Hence the delay in my answering your letter. It seems then the Balata is by no means neglected and in fact it would find ready purchasers if more of it came to the market. As it is, the supply is very limited and generally it comes only once a year. It commands a higher price than Gutta Percha and this in itself is a proof of its usefulness. It is used almost in all cases in which G. P. is used, but on account of its higher price only for superior purposes.

It seems that Balata is treated by the manufacturers simply as a superior kind of Gutta Percha and therefore its name disappears when manufactured.

Nevertheless Balata is distinctly different from Gutta Percha and this is especially manifested in some of its physical characters, for instance, it is somewhat softer at ordinary temperature and not so rigid in the cold.

The chemical composition however is probably quite identical with that of Gutta Percha and Caoutchouc.

In one respect Balata shews a very marked and important difference from Gutta Percha and that is in its behaviour under the influence of the atmosphere. Whilst Gutta Percha when exposed to light and air soon becomes altered on the surface and changed into a brittle resinous substance, into which the whole of the mass is gradually converted in the course of time, Balata on the other hand is but slowly acted upon under these circumstances.

I enclose a piece of Balata tissue which has now been in my possession quite six years and although it shows a peculiar mealy efflorescence due to a chemical change it is still supple and coherent; a similar tissue of Gutta Percha would have long before now become entirely converted into a brittle resin.

The electrical isolating quality of Balata is said to be quite equal to that of Gutta Percha. Altogether there seems no question about the valuable properties of Balata, all that is wanted is a sufficient and constant supply and a somewhat lower price. But even at its present price I think it would find a ready market if it came in larger quantities and thus enabled the manufacturers to use it for applications on a large scale.

As far as I could make out it is used by itself and not mixed with Gutta Percha.

One thing is also greatly in favour of Balata and this is the great purity in which it is brought into the market, when compared with the extent and the many kinds of extraordinary admixtures with which raw Gutta Percha is now adulterated before it reaches this country.

I think this is all I have to say about Balata and hope it will help to encourage the people of Demerara in producing more of it.

Yours sincerely,

HUGO MULLER.

Local Literature.—A paper entitled "Explorations in the neighbourhood of Mounts Roraima and Kukenaam in British Guiana" has been published by Mr. HENRY WHITELY in the August number of the *Proceedings of the Royal Geographical Society* (1884). Mr. WHITELY is a collector of birds who in the course of some wanderings round Roraima has made some valuable additions to the cabinets of European ornithologists. A valuable

adjunct to this paper is supplied in two sketches, one of Roraima, the other of Kukenaam, and in a map of the district.

A very different publication of local interest is a book of "West Indian Illustrations of Shakespeare" (JAMES THOMSON, Demerara, and JOHN HADDON & CO., London), in which a well-known official of the colony has published a set of his sketches of negro-life, and has fitted these with more or less appropriate Shakespearian mottoes. While it must be admitted—indeed the artist himself would be the first to admit—that the drawing is often very defective, it should I think not be lost sight of that these sketches are valuable not only as affording dwellers in the West Indies, who know negroes, many a hearty laugh, but also as being well adapted to afford those at home, whose ideas of West Indian negroes are of the vaguest, a true picture, hardly touched by caricature, of these important members of the population of the West Indies. The difficulty will be to persuade those at home of the truth that these drawings are not caricatures.

Another local publication requiring to be mentioned here, is the "Catalogue of the Exhibits sent from British Guiana to the Edinburgh International Exhibition," issued by the Exhibition Committee. It contains beside a descriptive list of the woods, barks, seeds, and other articles sent on exhibition, a long introductory chapter, in which, with other useful information, are given extracts from Mr. HUNTER'S (Royal Pimlico Dispensary) report on practical experiments made by him at the instigation of Baroness BURDETT-COUTTS on medicinal barks sent from this colony to the London International Exhibition of 1862.

DIED : Near St. Thomas, on board the Royal Mail Steamer *Esk*, on September 13th, 1884, ALEXANDER WINTER, Esq., Berbice, British Guiana.—Aged 73.

Report of the Meetings of the Society.

Meeting held 10th July.—The Honourable B. Howell Jones, President, in the chair.

There were 16 members present.

Elections.—*Associates:* John Wilson, Charles Borman, Reginald Bryan, Edward Pinnock and Henry Clementson.

Locust Gum.—A letter was received from Mr. H. Kirke, dated Calcutta, 13th May, in which he wrote as follows :—" Messrs. Nobin Chunder Dutt & Co., of No. 19, Dhurrumtollah Bazaar, in this city, have applied to me for some information with regard to locust gum or gum animi; as they are anxious to purchase some for trade purposes. I shall be glad if you will let this be publicly known, so that any dealer in that gum who wishes to open a trade with Calcutta may communicate with the firm above-mentioned."

The Campbell Memorial.—The Secretary read the following extract from a letter received by the Treasurer from Mr. W. Walker, of London :—" In accordance with your suggestion, I placed myself in communication with Mr. Browne, of Mincing Lane, and I enclose his son's reply, from which you will learn that the portrait of Mr A. W. Perot, now in the Georgetown Club, was executed by Mr. Halle, formerly of Regent Street, at the assumed cost of fifty guineas. Mr. Halle is, I imagine, not a portrait painter in the 'art sense,' but a reproducer of photographic portraits, in imitation of art portraits. I am glad Mr. Brown has reminded me of Mr. Thornycroft, a rising sculptor, whose name had not been previously

suggested to me." (Mr. Brown's letter, enclosed by Mr. Walker, was also read to the meeting.)

The President said that in reference to this matter there had been some misapprehension with regard to the intention of the Society. It was felt by some members of the Society that the memorial of the late Mr. Campbell, which it was proposed to place in the Society's rooms, should be entirely provided for out of the funds of the Society. Such being the case, and not wishing that the society should be placed in debt, the Treasurer stated at a meeting or two ago, that the Society itself could not afford to give more than fifty guineas for such a memorial. The question was, whether the Society should alone undertake the work of the memorial to Mr. Campbell, or whether the Society should ask the assistance of members who were personal friends of the deceased, in placing a bust or portrait in the Society's rooms of greater value than could be afforded by the actual Society. It was for this meeting to decide how it should be. For his own part, he thought that the right course to adopt would be, that the Society should give a certain sum, and that members of the Society alone should be permitted to add whatever sums they wished, to provide for the memorial in question. He hardly thought that the Society, with the small amount of money at its command, was alone able to provide a fitting memorial.

Mr. Forshaw said that he was present at the meeting to-day from the fact that he had taken some interest in the question just stated to members by the President; and at the outset he would state that any action he had taken in the matter was not due to any antagonism

to the Society as a body, but was due, in the first place, to what he considered his duty, after having read a report of a meeting of the Society at which the question came up. He said that he felt it his duty, being, he might say, one of the oldest—or among the oldest—friends of the deceased; and not only so, but because he felt that as a matter of gratitude to his memory he should take the steps which he did. The intimation given by the Society at the meeting to which he referred was, that the funds of the Society were in such a condition that they could not afford to give the amount that was required to procure a suitable memorial to the memory of their late honorary Secretary. Thereupon, he took the matter in hand, feeling sure that if he made application to members of the Society, most of whom were personal and valued friends of Mr. Campbell, as individuals, they would respond heartily and liberally; and he was glad to say that the step which he had taken met with the universal approval of every member of the Society to whom he made application, and contributions had been most liberally and ungrudgingly given towards the object in view. The President had spoken to him, requesting that he should not make any further appeal to members of the Society, before he (the President) should have had an opportunity of bringing the matter before the Society at its meeting: with the object that if the Society were willing to contribute a certain amount from its funds, that the amount which he (Mr. Forshaw) had collected should be handed over to the Society, or that the list which he had opened up should be handed over to the Secretary to continue the appeal to members, as agent of the Society. He at

once adopted the suggestion, because his own view of the matter was that, it would be more fitting that the memorial should come, as it were, from the Society, or, at any rate, that the Society should be the moving spirit in connection with it. He thought that he had collected something like £80, but was confident that he could have collected a couple of hundreds. He was quite willing to hand over the list he had opened to the Secretary, for the purpose of procuring further subscriptions; but if the amount he had on his list was sufficient together with what the Society would be willing to contribute, then there was an end of the matter.

The President thought that the question should be put to the meeting whether the Society would permit the members to add to the sum of money which it was proposed that the Royal Agricultural Society, as a body, should give towards the memorial to Mr. Campbell. If this was negatived, then anything which might be done by members certainly could not be done in the rooms of the Society.

The Treasurer said that he had expressed his feeling on the matter before, and he still adhered thereto; that the funds of the Society should pay alone for the memorial to the memory of Mr. Campbell; but as the funds of the Society could not afford a "bust" 200 guineas being the price demanded, he was of opinion that a portrait picture of deceased should be obtained, and he considered it would serve the purpose equally well. Besides, the building at present occupied by the Society would be the greatest memorial to Mr. Campbell's memory, he being the person who virtually got it up.

Mr. Nind said he had listened to what had fallen from

the lips of Mr. Forshaw, and there seemed to have been some misapprehension that the Society could not afford funds for a suitable memorial to the late Mr. Campbell, and aspersions had been cast on the Society; but he did not think that was quite the case. The Society, or those who were present at the meeting in question, stated that they were unable to find sufficient funds for a bust, as, he believed, it would cost 200 guineas. It seemed to him that the question was now re-opened as to whether the memorial should take the form of a picture or of a bust. He would vote for a picture. There was something cold in marble and something classical. It was all very well for a great Greek or Roman hero to be sculptured in white marble; but with respect to those with whom one mixed in Society and knew intimately, and respected and loved, it was more desirable that they should be presented through the medium of the canvas. Such a portrait ought to last for 50 years, and he thought that time ought to be sufficient for their intention.

Mr. Forshaw said that Mr. Nind had remarked that he (Mr. Forshaw) had cast some aspersions on the Society in his letter to the Press, but his letter was based on a newspaper report of the meeting in question.

Mr. Sherlock coincided with Mr. Nind that a picture should be got.

Mr. Glennie said, as a contributor to Mr. Forshaw's list, he would say that when asked to subscribe he did so feeling that it was perfectly proper, and he was sorry that any discord should have arisen in consequence in the Society. However, he understood that every person who had put his name down on Mr. Forshaw's list was a member of the Society, and he thought that the money

thus collected should be accepted by and handed over to the Society.

Mr. Jones said that the only difference which existed was whether the memorial should be procured by the Society's funds or whether members, personal friends of the deceased, should be allowed to supplement the sum which the Society might give. The meeting had first of all to decide this question; and he moved that: "the amount proposed to be expended by the Society towards a memorial to the late Mr. Campbell be augmented by subscriptions from individual members of the Society."

This was seconded by Mr. Barr, and carried, the only dissentients being the Treasurer and Mr. Nicholson.

Mr. Forshaw next moved that a bust of the late Mr. Campbell be procured, at a cost not exceeding 200 guineas, and placed in the rooms of the Society.

Mr. Nind moved, as an amendment, that a picture be painted of the deceased by an eminent artist, and placed in the rooms of the Society,—the cost not to exceed the amount subscribed.

Mr. Shields moved, as a second amendment on the motion, that the point as to whether the memorial should take the form of a picture or of a bust should be relegated to a committee.

The President ruled the latter amendment out of order, on the ground that it had already been decided that the Society should decide that point at a general meeting.

Mr. Nind's amendment was then put to the meeting, and carried, by nine votes against four.

The original motion was thus lost.

The President announced that he would be glad to subscribe to the proposed memorial on behalf of himself, Mr.

W. Russell, Mr. A. C. McCalman and Dr. Henery,—ten guineas in each instance.

In answer to Mr. Glennie, the President said that Mr. Forshaw could hand over his list to the Secretary.

On the motion of the Treasurer it was agreed that fifty guineas, now in the hands of Mr. Walker, London, should be handed over to the Secretary as the Society's contribution towards the proposed memorial.

The Funds of the Society.—The Treasurer handed in his quarterly account, showing a balance to the credit of the Society of $1,570 01 ; and Messrs. Glennie and Sherlock were appointed by the President to audit it.

Commercial Relations with Canada.—Mr. Nind next read an exhaustive paper on "Commercial relations with Canada."*

Mr. Glennie (who occupied the chair during the latter part of the meeting, in the absence of the President, who was unavoidably called away) moved a vote of thanks to Mr. Nind for his paper. In doing so he made reference to a statement of Mr. Nind's, that the Planters' Association in this colony had written to the Chamber of Commerce in Canada ; and informed the meeting that that step originated with Mr. Nind himself, as Chairman of that Association.

The vote of thanks was carried.

Donation.—The British Guiana Blue Book for 1883 by H.E. the Governor.

The meeting then dispersed.

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* This paper will be found in the present number of *Timehri* p. 308.

Meeting held 16th August.—The Honourable B. Howell Jones, President, in the chair.

There were 8 members present.

Elections.—*Corresponding Member*: Mr. Thorpe, editor of *Sugar Cane.*

Associates: W. M. Cox, Charles S. Hill, S. Walker, and A. P. Evelyn.

The Secretary reported the auditing and passing of the Treasurer's account by Messrs. Sherlock and Glennie, to whom the thanks of the Society were tendered.

A letter from Mr. J. Finlay Finlayson, dated San Francisco, June 12, was read in which he said he had forwarded to the Society a newspaper containing report of a lecture on British Guiana, he had delivered before the Geographical Society of the Pacific.

The Secretary said the newspaper had not arrived.

Mr. Nind's Paper.– The President said he was sorry Mr. Nind was not present, so that discussion on his paper, "Commercial Relations with Canada," might be opened. He (the President) regretted very much that he had to leave the chair at last meeting during the reading of the paper, as he should certainly have given notice at that meeting that the matter would be discussed at the present one. Mr. Nind was not present now, but there were one or two facts which he (the President) thought just as well to refer to in connection with the matter, and might interest those looking to Canada for any relief as regards the present depression of the sugar industry. The Government of Canada had taken a stand as protectionists, having to the utmost extent in their power protected the industries in Canada, in every way they possibly could. The hon. gentleman referring to a

pamphlet published by the Board of Trade, entitled the "Dominion of Canada" stated that in 1878 Great Britain imported into Canada 44·67 of the whole sugar; the United States 48·92; while the West Indies sent in 6·13. Of course a great deal of the sugar that went from the West Indies to the United States went into Canada. In the year 1879 when a change took place in the Canadian tariff, there was a great alteration in the import sugar trade of Canada. The imports of sugar from Great Britain decreased to 16·83 per cent.; from the United States to 15·38; and the imports from the West Indies rose to 57·3 from 6·13. So the West Indies were then sending into Canada a large portion of their sugar,—sugars of a low class more especially for the use of the refiners. In 1882 he found the West Indies sent in 59·4 per cent. of the whole sugar that went to Canada; from Brazil—also low class sugar—there was sent 21·7 per cent. Of course, this change did not much affect the sugar of Demerara, because it was of too high a class to be admitted into Canada; what the Canadians wanted was low class sugar and not sugar to compete with their refiners. It showed that the West Indies generally had been affected very largely by the Canadian tariff, though British Guiana had not been much affected by it. The change in the tariff that most affected us was in respect of molasses. The pamphlet gave the quantities of molasses that went from British Guiana. In 1877-78 British Guiana sent into Canada 6,440,193 lbs. of molasses, and the year 1878-79 during the latter half of which the change came into force, we sent in 3,379,000 or almost one-half. Then after that there was a change in the

method of calculating the molasses, it being given in gallons; but members could calculate it allowing 14 lbs. to a gallon. In 1882-83 the molasses sent into Canada from this colony amounted to 372,506 gallons, about a third of what was sent in 1877-78. So our trade, he thought, had been hit very hard indeed. There were other points in reference to Mr. Nind's paper; but he thought it would perhaps be better to continue the discussion when Mr. Nind was present. He ordered that it be announced in the advertisement calling next meeting, that the matter would be discussed. He might add with regard to Canada that the beet-root production in Quebec had proved a failure. At present there were five refineries in Canada, representing a capital of \$2,750,000, employing directly 3,500 persons, and giving employment indirectly to over 30,000; so it was not likely that Canada would alter her tariff in favour of any nation that would compete with her refiners.

The President laid on the table for the information of members the Custom Tariff of Canada from the year 1879 to the year 1884.

The meeting then adjourned.

Meeting held 11th September.—The Honourable B. Howell Jones, President, in the chair.

There were 13 members present.

Election.—*Associate:* Lloyd Price.

Commercial Relations with Canada.—The President referring to the proposed discussion on Mr. Nind's

paper "Commercial Relations with Canada," regretted that so few commercial members were present.

Mr. Nind, referring to what had been said by the President with regard to some of the ports of Canada being closed in the winter, said that there were a good many closed during six months of the year, but the port of Halifax was opened all the year round, and at that town there were two sugar refineries, and the town itself had excellent railway communication with several of the principal cities in the Dominion. A writer in one of the local papers who evidently wrote from a stand point of knowledge, had stated that the ports in Nova Scotia and New Brunswick were exactly the ports for us to send our produce for the Dominion, and these ports were open all the year round. As the position of affairs stood now, there were three ways of dealing with the present difficulty of the West India colonies. One was through the United States and the other two were through the home Government. As regards overtures between the Imperial Government and the United States for the granting by the United States of favourable terms to the West Indies, they had, he believed, a telegram that day indicating that negotiations for a reciprocity treaty were being entered into by the Secretary of State for Foreign affairs with the American Government. He did not know what it would come to, but he was not the least sanguine that the United States would agree to a reciprocity treaty with this colony, as he did not think America would gain much by such a treaty. The abolition of the bounties was another means by which they sought for some relief. If any in British Guiana were sanguine that the policy of the Imperial

Government would be to impose countervailing duties of bounty for sugar imported into the United Kingdom, he thought they were more sanguine than the generality of people on this point; but still, there was greater hope at the present moment than there ever was before. If the negotiations for a reciprocity treaty between the United States and these colonies failed, the Imperial Government would be thrown face to face with a difficulty which they must grapple with. If the question arose as to whether they should put on countervailing duties or lose the West India colonies, he thought there was no Government, however averse it might be to the policy of imposing countervailing duties, that would be able to stand against such a charge as that of the dismemberment of the empire, especially at this time, when a feeling that consolidation was desirable had been given expression to by many persons of note. If they got countervailing duties, the West Indies were all right; if they did not get that, then he thought the only other way out of the difficulty was to enter into some kind of negotiation with Canada. If there had been any gentlemen present that would have gone into this question and attacked in detail the important questions as to the difficulty of lowering the duties, &c., he should have been very happy indeed to have listened to what was said, and to have met such arguments to the best of his power; but such not being the case, there was nothing that had occurred to him to explain or amplify. He had in this case merely taken hold of the question in the paper he read, and he should have very much liked to have heard the question of the remission of duties in case of reciprocity treaties being made between the West Indies and America, discussed. With

regard to Canada, it must be remembered that it was a very growing country; the population of that country was increasing very rapidly—more largely than any other country under the British flag; and if they, the West Indies, with the colony of British Guiana, as a body—for they must go together—could make a treaty with Canada, they would get rid of 70,000 tons of the sugar produced annually—and they knew that our sugar had a very good name in London and other British markets; it would give them some relief and every day they might expect something better.

The President thought the time had come when the West India colonies, in a body, should try to force the hands of those now governing them on the other side of the water, and obtain a Commercial treaty either with the United States or with Canada.

Mr. Little asked Mr. Nind what remission we could make on imports from Canada or Nova Scotia. The chief item of import was salt fish, and if we remitted the duty on salt fish from Canada he did not see how we could enter into a reciprocity treaty with the States. The first thing America would demand from us would be a remission of the duty on any fish sent from the States. If the duty were remitted on fish from the States, the Boston market would supply this country for years to come. To-day we had received a telegram to the effect that there was some negotiation going on between the Imperial Government and the United States; and he thought if they should take the only duty off the Canadian and Nova Scotian imports, the only thing we would have to do would be to follow suit with the American Government. There was lumber of course, besides salt fish,

imported from Canada, and the duty on it was $1 per 1,000 feet.

Mr. Nind explained that he did not advocate the establishment of a treaty with Canada if we got a reciprocity treaty with the United States; but he did not think that that was possible. If reciprocity failed with the United States, then he said they ought to endeavour to get a reciprocity treaty with Canada. He thought we could get from Canada everything we got from the United States—anything in the way of wood, coals, staves, oils, &c.

The President brought forward a motion authorising them to open communications with the commercial centres of the several West Indian Colonies, towards arranging a Conference, at which delegates would be elected to proceed to England, thence to Washington and Canada, to seek relief for the cane sugar growers. Mr. Nind seconded the motion. Mr. Hawtayne asked the Meeting to be careful not to overstep its limits, the Society being purely non-political in its constitution. The President said the question was altogether a commercial one.

After some discussion, it was decided to leave the settlement of the motion to the next monthly meeting.

The Report of the Government Chemist on Sugar-Cane.—The President drew attention to the valuable report issued by Mr. Francis, Government Chemist, in which the analysis of various sugar canes in the Botanic Gardens were given. He hoped Planters would assist Mr. Francis in this important branch of his work, and be ready to forward him such sample of canes as he might desire for experimental purposes.

The Campbell Memorial.—The Secretary read an extract from a letter from Mr. Walker, in London, who stated that he would endeavour to carry out the wishes of the Society and get an oil painting of the late Mr. W. H. Campbell executed as early as possible.

Mr. Conyers mentioned that he had forwarded to Mr. Walker in all £175 towards this object; and an order was given that the subscription list should be closed on the 24th of this month.

The Estimates for 1885.—Mr. Conyers was instructed to request the Government Secretary to place on the Estimate for next year the items of $2,500 for the Museum, $2,000 in aid of the Curator's salary, and $2,000 in aid of the Biennial Exhibition of 1885.

Donation.—Mr. Hawtayne presented an essay on Forestry written for the local Forestry Exhibition in St. Vincent, by G. M. Browne. The thanks of the Society were awarded.

The meeting then dispersed.

Meeting held 11th October.—The Honourable B. Howell Jones, President, in the chair.

There were 13 members present.

Elections.—*Member:* J. Cook.

Associates: C. R. McKay and C. E. Tinling.

The Sugar Industry.—The President brought forward the motion of which he had given notice at the last general meeting of the Society: "Asking the sanction of this Society to the opening up

"of communication with like Societies in Barbados, Trinidad and the Leeward Islands in order "to bring about a conference at Barbados to consider "the whole question of the sugar industry." He said: In giving notice of this resolution it did not occur to me for one moment that any one would consider this a political question, and far from desiring, as chairman of this Society, to introduce the discussion of politics at the Society's Board, I would endeavour to do my best to avoid and prevent any member of the Society from discussing at this table any political question. The Act of Corporation of the Society prevents the discussion of any political question at its meetings. But, although discussion on any political question at this table was forbidden in the Act of Corporation, it certainly did not forbid the Society from endeavouring to bring about a conference such as the one I would like to see held at Barbados at an early date. The Act of Incorporation said, that, an essential principle of the constitution of the Society is the total exclusion at its meetings and in all its proceedings of all questions of a political nature or tendency, and which principle no resolution or bye-law of the said Society shall, on any account or pretence whatever, at any time infringe or controvert. The schedule of the Society's bye-laws lays down what shall be the objects of the Society, namely, to endeavour to promote, as far as possible, the improvement of the agriculture of the colony, and of every branch of industry, manufacture, or trade whereby the resources of the colony are likely to be developed and increased. I am certain that no one present can say that they consider the trade of British Guiana or the West Indian

islands is in such a flourishing condition that they could afford to quietly fold their hands and say: "We will do nothing." There is not the slightest doubt in the minds of everyone that the West Indies are passing through a severe crisis, and we are just at the commencement, and have not gone very far down the road. I believe we shall experience greater difficulties than we are now experiencing before brighter times come. And in order to prevent what would be a great calamity to our neighbours and a serious matter for ourselves, we should endeavour to do anything and everything to prevent that crisis being so very severe, by a meeting of delegates, persons who fully understand how to deal with the agricultural and commercial interests of the West India colonies. In asking the Society to lend its aid to a matter of this sort, I might say that the conference should be composed of persons who are deeply concerned in the sugar industry of the colonies, so that they could thoroughly well discuss and ventilate the subject; such subjects as those connected with the central factories and usines, which, if properly carried on would still attract British capital to the West Indies. I think that the existing commercial relations not only with England, but also with America and foreign nations require alteration, and if altered, a better and more prosperous state of things than at the present moment exists would be brought about. If delegates are sent from here to Barbados, they would be, as far as this Society is concerned, restricted entirely to this question of commerce and agriculture. I think it is one of the duties of this Society to promote the agricultural and commercial welfare of these colonies, and as president of this Society,

I do not think I have trespassed or infringed upon the charter granted to us, in bringing forward such a motion as the present one.

Mr. Pitman said he had, for the sake of discussion, much pleasure in seconding the resolution of the chairman. His views were in harmony with the resolution, that is to say, that to call together a conference of such a nature as the resolution implies, would not be at variance with the charter of the Society: the sole object of which is to promote the agricultural and mercantile interests of the colony. Demerara would not have so much to gain by the conference as the West Indian Islands; but he was quite sure that if Demerara would initiate a step of the kind, the neighbouring Islands would be grateful to her. He had great pleasure in seconding this resolution.

Mr. Hawtayne said: There was no doubt it would be advisable that there should be a conference of the description proposed, but it would tend to a discussion of politics, and that, the charter granted to the Society would not permit in the remotest degree. If these delegates to form a conference, go away clothed with the sanction and authority of this Society they will carry weight, and they could not divest themselves of that authority or that weight, nor would they divest themselves of that authority if they formed themselves, subsequently into a political body. I do not think that we could really shelter ourselves by saying that we sent you out in one capacity and you have turned yourself into a political body; but we should be answerable for what they said and what they did. He would raise his voice against any such thing being done.

Mr. Nind argued that the term "politics" in the Society's charter referred to those political questions brought before the Court of Policy, which should not be discussed here where there might be heated arguments and pressure brought to bear upon members of the Court. He was very much in favour of this motion as he thought it was our duty to do all we could in the matter. Any thinking man would see that the situation is this: that the Home Government are doing all that they can for the United States entering into a reciprocity treaty with the West Indies, and it is not likely that the United States will make any treaty unless preference is given to their manufactures, and that means this: that England will lose ten or twelve millions sterling in trade, and in the course of time British manufactures will be excluded from this colony, the Union Jack will be hauled down and the Stars and Stripes hoisted in its place. That might be a very good thing but, he supposed he was talking politics and he hoped they would pardon him (laughter). If we are to be incorporated with Canada, we should still make a better stand if we were joined to the West India Islands than by being by ourselves; the same argument applies to the United States. With regard to the motion, he thought it one the Society could grant, and one which at the present moment it should grant.

Mr. Sherlock said: If anything is needed to convince one that the subject which has been initiated would very soon reduce itself into a discussion of politics, the very able speech of Mr. Nind would do so. The Elective members of the Court of Policy had sent home a petition, one had gone from the planters, and another from the general inhabitants of the colony. A letter has already been

received from Lord Derby in which he states that he understands our position and he is trying to do the most he can for us. He therefore thought it unwise for the Society as a non-political Society, to do anything at the present moment.

Mr. Glennie agreed with Mr. Sherlock. We are merely struggling and striking out in all directions; and until we know what is to be done in connection with the petition already sent home, and the negotiations now going on between Britain and the United States, it was a sort of idle work. He would not like to throw cold water upon any effort, but for this effort to take place under the auspices and wing of this Society he considered it could not be supported, as the question was of a political nature.

Mr. Winter said: his sympathy was entirely with the resolution, but he thought the speech that had been made by the chairman in introducing the motion offered as strong an argument against it as could be produced. He then showed how the adoption of the motion would in all probability prejudice the interests of the Society.

After the President had replied, the motion was put to the meeting when five voted for and eight against it.

Donations.—A letter was read from the Government Secretary accompanying the presentation to the Society of a copy of Schomburg's maps. A work on the island of Tobago was also presented to the Society by the honourable Mr. Killop, of that island.—The thanks of the Society were accorded to the donors.

A letter from the editor of the "Sugar Cane" returning thanks for having been made a corresponding member of the Society was read.

The Treasurer's account showing a balance in favour of the Society of $908 77 was laid over.

The meeting then terminated.

Meeting held 15th November.—The Ven. Archdeacon Austin, in the chair.

There were 8 members present.

Elections.—*Members:* Mr. George Garnett and Revd. J E. London.

Associate: F. E. Goldsmith.

The Secretary read the following letter :—

Government Secretary's Office,
Georgetown, Demerara,
27th October, 1884.

Sir,—I have the honor by direction of the Governor to transmit to the Royal Agricultural and Commercial Society the accompanying copy of "More Leaves from the Journal of a Life in the Highlands, from 1862 to 1882," bearing Her Majesty's autograph signature.

2. Her Majesty desires that this Book may be placed in the Library of the Royal Agricultural and Commercial Society, as evidence of Her Majesty's interest in that institution, and of Her belief that this record will not fail to be appreciated by Her subjects in British Guiana.

F. J. VILLIERS.

The Secretary of the
Royal Agricultural and Commercial Society.

The thanks of the Society were accorded to Her Majesty, through the Government, for the very valuable presentation.

Donations.—Mr. Hinds, publisher of the *Echo,* Plaisance, presented a file of his paper, from num-

ber one to date. Mr. Æ. Mackay presented 4 Canadian Blue Books on Trade, Navigation, and Public Works. Mr. Hawtayne presented a copy of his "Taxidermic and other Notes." The thanks of the Society were voted to the respective donors.

The Campbell Memorial.—The Secretary read extracts of two letters from Mr. Walker, acknowledging remittance towards the Campbell memorial and saying that he felt somewhat embarrassed as to the proper means of giving effect to the wishes of the subscribers that the memorial should consist of an oil painting, executed by an eminent artist, from a photograph of the deceased. In his second letter, Mr. Walker said he had not yet taken any definite steps in the matter, although he was still searching for an eminent artist who would be willing to undertake the work. It would be some relief to him if the Society were to instruct him to have a bust executed, for which he had now in hand sufficient means, instead of the portrait. It was suggested by the Chairman and Mr. Imlach that discussion on the subject be postponed till the next ordinary meeting, when there might be a better attendance than there was to-day, notice to be given in the newspapers that the subject would come up for discussion.

The Forestry Exhibition.—The following letter was read by the Secretary :—

Gracechurch Street, London, 16th October, 1884.

F. A. Conyers, Esqr.

My dear Sir,

I have now to report that the Forestry Exhibition was finally closed on the 11th instant, and with the assistance of Dr. Imlach, the exhibits were divided between the Museum of Science and Art in Edinburgh, and a new School of Forestry about to be opened in Edinburgh. The

round table sent by the Committee has been handed over to Dr. Imlach, and the small oval one forwarded by Messrs. Park and Cunningham has been given to Mr. Sandbach of "Hafodimes," and I shall settle with these gentlemen when I know the cost. I may remark that the samples of woods split very much in course of drying, and if a similar collection is ever sent to Europe some time should be allowed for curing before being dressed. The catalogues arrived and have been distributed; unfortunately they throw very little additional light upon the scientific names, beyond what I was enabled to gather from McTurk's article in *Timehri.*

WM. RUSSELL.

Mr. Winter said that the first table referred to in Mr. Russell's letter had been sent to the Museum; it was a very handsome piece of work, and he understood it was to be returned. The base of the table was still in the Museum.

The Secretary said that that was a matter for the Committee of Correspondence to deal with, and it would be brought before that Committee in due time.

The Treasurer moved that the thanks of the Society be given to Mr. Russell for the able manner in which he had represented the colony at this exhibition; and also to Dr. Imlach and Mr. Shaw (at one time, the manager of Pln. Anna Regina in this colony), who had taken an active interest in connection with the exhibits forwarded from this colony.

Mr. Sherlock seconded the proposition which was unanimously carried.

The meeting then terminated.

Meeting held 13th December.—The Honourable B. Howell Jones, President, in the chair.

There were 12 members present.

Donations.—The following donations were made to the Society, and the Secretary was directed to tender the Society's thanks to the donors :—

"West Indians Yarns, by X. Beke,"--presented by Mr. G. H. Hawtayne ; "The River Tweed from its source to the sea"—presented by Mr. R. W. Imlach ; "The Epinal Glossary," forwarded by the Acting Government Secretary with the annexed letter :—

29th November, 1884.

Sir,—I have the honor by direction of the Governor to forward to you under separate cover for presentation to the Royal Agricultural and Commercial Society a copy of the Epinal M. S. which has been received from the subscribers through Her Majesty's Principal Secretary of State for the Colonies.

F. J. VILLIERS.

The Honorary Secretary of the
Royal Agricultural and Commercial Society.

A photographic "view of Clough paddles taken out of a sluice at the Trafford Dock, Liverpool, March 1859," was sent to the colony by Dr. Imlach for the purpose of presentation to the Society, with this memorandum :—"The dock was built in 1843 and the paddles supplied new at that date. The part formed of English Oak is decayed and completely worn out. The Greenheart from Georgetown, British Guiana, remains as sound as when first used."

The Sugar-trade Crisis.—The Secretary said he was in receipt of a letter from Mr. Richards, chairman of a public meeting recently held in St. Lucia, forwarding the annexed resolution with reference to the Sugar Industry of the West Indies :—

That this meeting would suggest that the British West India Colonies should, by concerted action with the general Trade Unions and Associations interested, urge upon the British Government the

necessity and justice of imposing a countervailing duty on bounty-fed sugar as the only fair and practicable means of permanently and effectually averting destruction of the British and Colonial sugar industry; and with a view to carrying out the object of this resolution, that the Chairman be requested to correspond with the Chambers of Commerce and Agriculture in the several Islands.

The President said that as the matter had already been dealt with by this Society, and everything that could be done in respect to the present condition of the sugar industry, he believed, had been done, a courteous reply stating the decision this Society had arrived at in the matter might be forwarded to Mr. Richards. The suggestion was adopted.

The Colony Birds.—The President in regard to the collection of birds recently left by Mr. Whitely, in the Museum, read the following letter:—

Zoological Society of London,
13th October, 1884.

Sir,—I venture to trouble you with reference to the collections of birds made by Mr. Henry Whitely in British Guiana, which, taken together, form by far the best and largest series of the birds of the country that has been brought to Europe.

Mr. Whitely has, I believe, disposed of the greater portion of his specimens in this country, but retains with him, on his return to British Guiana, a complete set.

I beg leave to suggest that it would be very desirable that this set should be acquired for the Museum in Georgetown, or for some other scientific institution in British Guiana.

I may mention that in conjunction with Mr. O. Salvia, I am about to prepare a complete list of all the birds obtained by Mr. Whitely, of which I shall be pleased to forward to you copies when published.

Trusting you will excuse my addressing you under the circumstances mentioned.

P. L. SCLATER,
Secy. to the Zoological Society of London.

The Hon. B. H. Jones.

Mr. Whitely had again gone on a forest expedition, and had asked him (Mr. Jones) to mention to the Society that he would prepare duplicates of all the specimens of birds he might make use of in another collection. He would not be able to make this collection a donation to the Society, however, but if the Society would purchase them, he would be quite willing to hand over a complete set. It was not a matter that would occupy their attention to-day, but he (Mr. Jones) considered it would be well worth the Society purchasing a further collection of birds from Mr. Whitely, especially when it was seen that he had already presented such a very valuable collection to the Society.

Mr. Glaisher said he did not think a more complete collection of birds had ever been made in this colony, and it would be extremely desirable to have a further collection sent them by Mr. Whitely.

The Calcutta Exhibition.—The President then referred to the valuable services rendered in behalf of this colony by Mr. Kirke at the Calcutta Exhibition. He said the recognition of his services should have been made long before now. But he did not think they should allow the year to close without tendering the thanks of the Society to Mr. Kirke for the onerous work he had performed for the Society, while in India, in connection with the Calcutta Exhibition. He therefore moved that the thanks of the Society be tendered to Mr. Kirke.

Mr. Hawtayne said he had great pleasure in seconding the resolution, which was subsequently carried unanimously.

Mr. Kirke in returning thanks for the vote passed

to him observed that, while to some extent the Exhibition in Calcutta, as far as British Guiana was concerned, had led to good results, it had not been as successful as it ought to have been, or as it might have been, if there had been more time spared in preparing the exhibits and sending them away in proper order. As it was, they did not reach him more than ten days before the exhibition was opened, and at a time when all the cabinet makers and such persons whose services were most required, were already engaged. It was therefore impossible for him to put the British Guiana Court in such a good condition as he would have liked to see it. There was some satisfaction, however, in the number of awards given to the colony. He might also say that it was very important indeed that British Guiana had been represented at the Calcutta Exhibition, as there was not one in a million—he might say ten millions, there that knew anything whatever of the colony, even among many of those who it was considered ought to have been well informed. He also thought it had done some good in the promotion of emigration to this colony, and that, he thought, was of the greatest importance. He admitted that he had felt hurt at the absence of recognition of his services; but he was willing to accept the Society's vote of thanks as full compensation.

The Campbell Memorial.—The Secretary said that a good deal of correspondence regarding the proposed Campbell memorial had passed between himself and Mr. Walker the Society's resident Director in London, who had been directed to procure the services of an eminent artist who would undertake to execute an oil painting

portrait from a photograph of the deceased. Mr. Walker said it would be some relief to him, however, if the Society would instruct him to have a bust executed (instead of the portrait) for which the funds were amply sufficient. The Secretary said that in order to bring the matter to a head he would move that the question with respect to this memorial be reopened.

Mr. Hawtayne seconded the motion, which was carried, and the Secretary subsequently gave notice of motion he intended to bring forward at the next meeting for the purpose of rescinding the former resolution on the subject.

Fossil found on Pln. Farm.—The President drew attention to specimens of coral lying on the table that had been found in the mud at pln. *Farm* on the East Demerary River.

The President said that as this would be his last meeting for the year, he would take the opportunity to thank the members for their kindness and assistance to him during the time he had occupied the presidential chair. Several interesting questions had been discussed, and although sometimes there had been a difference of opinions, he thought as a whole the various arguments that had been brought forward had been brought forward with coolness, and without any angry feelings between members and the presidential chair. It had been all along the right of the retiring President to propose his successor, and he had great pleasure in proposing that the hon'ble A. Barr be elected to the chair for the ensuing year.

The proposition was seconded and carried.

Election of Office Bearers for 1885.—The following were elected :—

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Vice-Patron :

HIS EXCELLENCY SIR HENRY TURNER IRVING, K.C.M.G.,
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The thanks of the Society were accorded respectively to Mr. Walker, Mr. Imlach, and Mr. Conyers for the services they had rendered during the present year.

On the motion of Mr. Drysdale, seconded by Mr. Hawtayne, a vote of thanks was passed to the President for his services during the year.

The meeting terminated.

Erratum.—June 1884, *Timehri,* p. 179, After the words "if Dr. Henery could be induced to allow his "figures to be published," read as follows:—"The gallons "on that estate I believe are high, being 2000 to a hogs-"head of less than a ton, and I would suggest to those "present whether there may not be some relation be-"tween the quantity of fuel consumed and the number "of gallons used."

OWING to the absence of the Editor, on the expedition to Roraima, the index to the 1884 volume of *Timehri* could not be prepared in time to issue with this part; but it will be issued with the next. A memoir of the late Mr. WINTER, by the Editor, will appear in the June number.

"TIMEHRI,"

BEING THE

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EVERARD F. IM THURN, M.A., of Exeter College, Oxford.

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